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STATE OF CALIFORNIA

FISH AND GAME COMMISSION

TWENTY-THIRD BIENNIAL REPORT

For the Years 1912-1914

CALIFORNIA
STATE PRINTING OFFICE
1914

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MAP of CALIFORNIA
Prepared for the
STATE FISH AND GAME COMMISSION
CHAS. L. GILMORE
ENGINEER-DRAFTSMAN
DEL NORTE
HUMBOLDT
TRINITY
MENDOCINO
SISKIYOU
MODOC
LASSEN
SHASTA
TEHAMA
PLUMAS
BUTTE
GLENN
SIERRA
NEVADA
COLUSA
LAKE
SUTTER
YUBA
PLACER
EL DORADO
SONOMA
NAPA
YOLO
SACRAMENTO
AMADOR
ALPINE
MARIN
SOLANO
CONTRA COSTA
CALAVERAS
SAN JOAQUIN
TUOLUMNE
MONO
SAN FRANCISCO
ALAMEDA
STANISLAUS
MARIPOSA
SANTA CLARA
MERCED
MADERA
FRESNO
INYO
SAN BENITO
MONTEREY
KINGS
TULARE
SAN LUIS OBISPO
KERN
SANTA BARBARA
VENTURA
LOS ANGELES
SAN BERNARDINO
SAN MIGUEL
SANTA ROSA
SANTA CRUZ
ORANGE
RIVERSIDE
SANTA BARBARA
SANTA CATALINA
SAN NICOLAS
SAN CLEMENTE
SAN DIEGO
IMPERIAL
PACIFIC OCEAN
LITTLE KLAMATH LAKE
KHETT LAKE
CLEAR LAKE
GOOSE LAKE
EAGLE LAKE
HONEY LAKE
MONO LAKE
OWENS LAKE
TULARE LAKE
SALTON SEA

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LETTER OF TRANSMITTAL.

SAN FRANCISCO, CALIFORNIA.
June 30, 1914.

Honorable HIRAM W. JOHNSON,
Governor State of California,
Sacramento.

SIR: In accordance with law, we submit for your consideration a statement of the transactions and disbursements of the board for the biennial term July 1, 1912, to June 30, 1914.

The report, we feel, covers fully the many operations of the board for the biennial period treated of, but there are certain features of it to which we desire to call your particular attention.

As the division reports show, much authority previously held by the head office has been delegated to the branch offices, in charge of individual commissioners and division chiefs. This new system has not only relieved the head office of a great many routine matters, but has given the several parts of the state local supervision of affairs, and some one in authority, always quickly and easily reached, to give information and settle disputed questions. The system also permits of a more satisfactory management of the patrol service, which consideration alone, in our opinion, more than justifies its added cost. The work of the various divisions has been not only highly satisfactory but has in fact shown a steadily increasing improvement. Consequently we feel justified in stating that there has been and is now a better management of the board's business than was ever possible under the old system of centering the control of affairs in a head office in charge of a chief deputy.

During the past two years the board has had at all times the services of an attorney, the wisdom of which plan is proven by the greater effectiveness of the patrol service and the more satisfactory handling of prosecutions. As this report shows, the board prosecuted during the two years just past 1993 cases involving violations of the fish and game laws, and out of this number obtained convictions in 1653 cases. The percentage of convictions obtained, 83 per cent, is, so far as we know, the highest ever obtained in the country by any fish or game board. During the period covered by this report, the board has been involved in some of the most important litigation in its history. The satisfactory termination of all this litigation should be sufficient evidence of the effectiveness of the legal department.

As stated by the Superintendent of Hatcheries in his report, it has been the purpose of the board to build up this department to the highest degree of efficiency. No effort or expense has been spared to

give the entire state the best possible distribution of food and game fishes. The board believes also that more fish screens and fish ladders have been installed or authorized than during the previous history of the commission. In the opinion of the board, the work of the hatchery department during the past two years has been the most successful in its history. The Superintendent of Hatcheries can not be too highly commended for the splendid services given by him to the state during this time.

The board's operations in the field of game propagation and distribution have been less extensive during the past two years than for the preceding biennial term. The work of this department has been curtailed, primarily, because the purposes for which it had been created had been served and also because it has seemed desirable to reduce expenditures in this particular direction. The board's operations at the Hayward game farm have disclosed the fact that practically all of the foreign game birds hitherto imported into the state are unsuited to our conditions. A possible exception is the ringneck pheasant, which seems to be adapted to certain humid valleys along the coast. The board has hopes that the pheasant may establish itself in the state and prove a desirable addition to the stock of native birds.

The board has continued its policy of obtaining required data as to stream and water conditions, as is well set forth in the report of the Engineer-Draftsman. An effort has been made, also, to carry on a systematic inquiry as to fishery methods and conditions. A great deal of data has been collected and compiled by special assistants of the board and will be available for such use as the coming legislature may care to make of it. It is planned to give publicity to the fishery investigations through the medium of free bulletins, several of which are now in course of preparation.

One of the deputies has very kindly prepared an interesting paper dealing with the southern Sierras and the desert region, parts of the state of great interest to the fisherman and hunter, but which are not generally known and appreciated at the present time.

We desire to commend for your careful consideration certain contributed articles, the first dealing with "Arid California and Its Animal Life," written by Mr. Frank Stephens, a naturalist of note; the second, "California Fishing Industry from a Commercial Point of View," written by Mr. F. E. Booth, one of the principal commercial fishermen of the state; the last, "National Forests in California," which has been prepared at the board's request by Mr. W. C. Hodge, forest examiner of the United States Forest Service.

We are including in this report a roster of the board's employees as on June 30, 1914. On August 10, 1913, the board's employees and assistants were included in the classified list of state employees under civil service. Nothing that has happened in the forty-three years of the board's history has been fraught with such possibilities of good as this going under civil service. Every employee is now assured that the permanence of his position and the certainty of promotion are matters that rest entirely with him and not with some political power.

As will be noted, the board's revenues have been entirely derived from the sales of licenses, from fines paid into the state treasury for violations of the fish and game laws and from certain miscellaneous and unimportant sources. As a matter of fact, no appropriation of whatever nature or amount has been made for the board's maintenance since the legislative session of 1909. This policy has been based on the theory that fish and game conservation in California should be made self-sustaining, and that the burden of carrying on such work should be placed upon those who profit directly from a supply of fish and game in the state. Under this programme, the four thousand market fishermen, the one hundred and sixty thousand hunters and the eighty odd thousand anglers pay for their profit and pleasure, while the general public, which is only indirectly interested, is relieved of all expense.

Within the past two years the Board of Control has installed a very comprehensive and satisfactory system of records and accounts for the board. Through the use of this system the board is now able to publish each month a statement of disbursements covering every item of expense. It is believed that the hunters and fishermen, and the public as well, will appreciate this much needed provision for a monthly accounting.

Your attention is respectfully called to a comparative statement of the arrests made by this board for a period of twelve years, beginning with 1902. This statement shows that practically one fourth of the total of all arrests for the twelve years have been made during the last biennial term, and further, that almost one half of all arrests made in the said twelve years have been made during your term of office.

As the period covered by this report ends, the commission is reestablishing what in its opinion will become one of the most important branches of the service. The board has been fortunate in securing, as the head of the department, Dr. H. C. Bryant of the University of California, whose work will be the study of game life histories, the working out of methods of conservation and the instruction of the public as to the purposes of the work of his department. In his work Dr. Bryant will have the cooperation of university attaches and of the leading wild life conservationists the country over.

Very few recommendations as to new legislation are included in this report, the board preferring to collect all possible data as to conditions and to hold the same until called upon by the legislature for suggestions.

The board wishes at this time to express its appreciation of the splendid assistance received from state officers, boards and commissions, the universities, the United States Forest Service, and from the large transportation companies and many private citizens. The successful conduct of the board's business has always been and is now largely due to such cooperation.

In conclusion, we desire to state that the board has been actuated in its labors solely with the idea of conducting the affairs entrusted to it in such manner as to benefit all the people of the state, without regard to class or location. The laws have been enforced strictly but justly upon preserve member and unattached hunter alike, as the records will show. It can not be claimed with any degree of truth whatever that the commission has been subservient to any special class or interest, nor do we believe that the general public any longer looks upon the commission as being a class institution.

Respectfully submitted.

F. M. NEWBERT, *President,*
M. J. CONNELL,
CARL WESTERFELD,
Board of Fish and Game Commissioners.

By ERNEST SCHAEFFLE,
Executive Secretary.

Loch Leven trout from Big Pine lakes in Inyo County. Largest fish 5½ pounds. Planted by Fish and Game Commission in 1909.

DIVISION REPORTS.

SAN FRANCISCO DISTRICT.

By J. S. HUNTER, Assistant Secretary.

Game Conditions.

During the past two years, the game situation in the San Francisco division has been very satisfactory. There is yet an abundance of all native varieties of game and with some slight changes in the laws now in force a very considerable increase should be noted in all sections.

Deer.

In many sections the deer are far more abundant than they were a few years ago, but in other sections there has been a very appreciable decline each year. On another page is listed the kill of deer throughout the state. This list is based for the most part on the records obtained by our deputies. It is probable that the actual number killed would be double that given. From these figures it can be easily understood how essential it is that better protection be given if we are to retain one of the most valuable natural assets that we have in our state.

A suggestion has been made that the law prohibit the killing of spike bucks. If such a law were in force, it would decrease the number killed by at least one third. It would also reduce the number of does that are frequently killed by mistake, as it often happens that a doe is mistaken for a spike buck.

The present open season for the coast section is much too early. There is no place where deer should be killed as early as July first. The horns are in the velvet, very soft, and do not make attractive trophies. The season should be arranged between the time the horns become hard and the rutting season, as during the rut the flesh is strong and distasteful in flavor.

There has been no severe epidemic among the deer, such as occurred in Trinity and the adjoining counties during the summer and fall of 1911. It was reported, however, in the fore part of 1914 that the deer were dying in considerable numbers in the northern part of Sonoma and Southern Mendocino counties. It was impossible to carry on an extensive investigation, as reports were not received until after the worst of the trouble was over, but from the information gathered it would seem that approximately four hundred deer died. Some of those examined were infested by a small intestinal parasite, possibly that known as *Nematodirus filicollis*. This parasite occurs commonly in nearly all deer, and in this particular instance apparently developed in abnormal

numbers, resulting in the death of the animals. It is not believed that this abnormal development was caused by any scarcity of food for the deer, nor to any severe climatic conditions, as the winter in that section was practically normal. It is interesting, also, to note that there was a severe loss in the same section by various sheep ranchers. One rancher lost over three hundred yearling sheep of apparently the same trouble. All of the deer that died were yearlings, except a few bucks and does on one of the larger ranches.

The small remnant of the Roosevelt elk, which are now found in the northern part of Humboldt County and in Del Norte County, seem to be increasing, if the reports received can be relied upon. We have no reason to suspect that any of these animals have been killed during the past two years. The people in the section where they range are in entire accord in giving them absolute protection. With this protection, there should be a rapid increase in their numbers as the territory over which they range is limitless in extent.

Valley and Mountain Quail.

Quail in the greater parts of the coast district are barely holding their own. The season for the taking of valley quail and the bag limit is greater than the supply of birds will warrant. It must be remembered that the best quail sections in Monterey and other counties were thoroughly combed over by the market hunters in recent years, and that the birds have not had an opportunity to increase on account of the great number of hunters who kill off every season so many of the breeding stock. The year of 1913 was a poor one for both species of quail, and in many sections they did not pair off, probably on account of the scarcity of rain. The present year, however, will probably be a record breaker, as young quail can now be seen everywhere.

Ducks.

In the bay region, the season of 1912-1913 was far more satisfactory than that of 1913-1914. Probably only one half the number of birds were killed during the latter year that were taken in the season of 1912-1913. It is impossible for us to determine the cause. There were in the season of 1913-1914 a greater number of canvasback. In fact, it is said that in the San Pablo Bay region canvasback have not been so abundant for years. Limits of this excellent duck were the rule rather than the exception in that part of the country for a number of weeks. The closing of the season at the beginning of February by the new federal law has been exceedingly beneficial, as greater numbers of ducks have been noted as breeding. Young mallards were seen in the Alviso Marsh in the early part of March, showing that the parents must have paired off not later than the month of January.

It should be mentioned that the first arrests for the violation of the federal game law in the United States were made by our deputies in the San Francisco Bay region. There was no difficulty in securing convictions in every one of the cases brought before the court, and it would seem that the sportsmen are in accord with the provisions of this new law.

Other species of game, rabbits, squirrels, doves, etc., can be found in abundance in practically every county of the district; even in counties that are adjacent to the great population of the bay region there are many places where good shooting can be had.

Ringneck Pheasants.

Very encouraging reports have been received from the plants of pheasants which have been made in various parts of the state. The area that is adapted to the peculiar requirements of these birds is limited, consequently they probably never will range throughout the state. After they have established themselves in the well watered valleys where insect life is abundant, they may extend their range into the rougher foothills, but it is impossible to start them successfully upon the brush covered hills.

During the past several years, over four thousand pheasants have been liberated. This number, together with those raised this year, will be sufficient to show whether the species will find conditions adapted to a prolific increase.

The Work of Deputies.

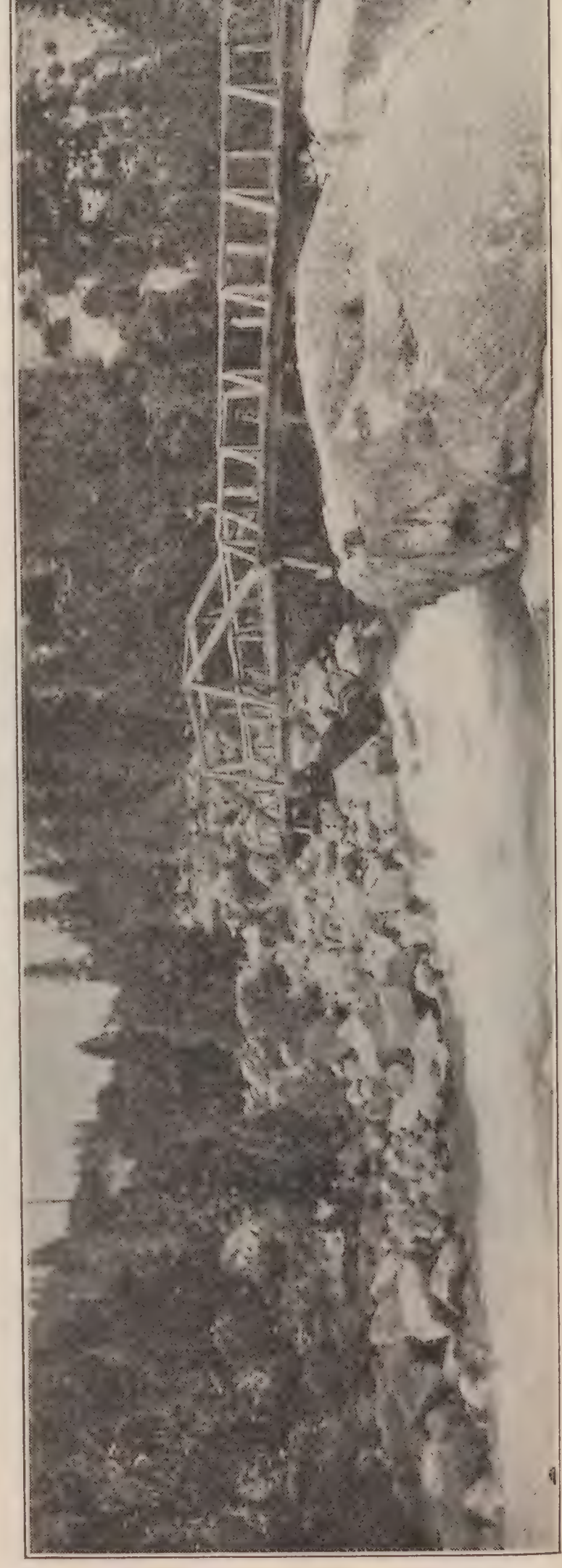
The deputies throughout the San Francisco District have without an exception, been doing excellent work. Particular mention should be made of the work in Humboldt County, where, on account of the conscientious manner in which the deputies have worked, they have moulded public opinion so that convictions are the rule, rather than the exception, as they were in former years. Some of the largest fines in the history of the commission for the possession of deer meat during the closed season have been imposed in this county. This change of public opinion has not been confined entirely to Humboldt County. In Mendocino County a hotel proprietor, who was charged with having deer meat in his possession during the closed season, demanded a jury trial, was convicted by a jury of his fellow townsmen, and was fined a substantial sum by the justice, also a fellow townsman.

Great credit should be given to Mr. Frank C. Clarke in this case, as it was based entirely on work that had been done by him. Through this work it is now possible for us to positively identify a piece of venison, no matter how cooked or treated.

The work of the deputies in San Francisco has also been particularly gratifying. This has been brought about by the heartier cooperation of the courts. During the season three years ago there were fully 250,000 wild ducks brought into the San Francisco market for sale. Previous to that time, there had been organized, to get around the bag limit law, a system of "game transfer companies." It was impossible for the commission to break up these companies until the fall of 1913, when a decision rendered by one of the superior judges showed that they were organized merely to evade the law and recognized the power of the commission to confiscate all ducks that were shipped to them. The total receipt of ducks in San Francisco during the season of 1913, including those shipped in by the market hunters and those shipped by resident sportsmen, was scarcely one third of those shipped in when the game transfer companies were running without hindrance. This can not be attributed entirely to the scarcity of ducks; but credit should be given to the superior judge who made it possible to break up the game transfer companies.

Hancock Lake, Siskiyou County, in Sacramento District; headwaters of Salmon River. Stocked with black spotted trout from Sisson hatchery.

Falls of South Fork of San Joaquin River. Headwaters of stream stocked with Golden trout in 1914.



United States Forest Service Bridge on upper San Joaquin River.

A RESUME OF WILD GAME AND THE CONDITIONS PERTINENT THERETO IN NORTHERN CALIFORNIA.

By GEORGE NEALE, Deputy in Charge, Sacramento District.

The Sacramento Administrative District of the Fish and Game Commission is composed of the following counties of the First Fish and Game District: Siskiyou, Modoc, Shasta, Lassen, Trinity and Tehama; the following counties of the Second Fish and Game District: Glenn, Colusa and Yolo; the following counties of the Third: Plumas, Butte, Sierra, Sutter, Yuba, Nevada, Placer, El Dorado, Alpine, Amador and Sacramento; also San Joaquin County in the Fourth Fish and Game District.

Thus this administrative district comprises twenty-one counties covering an area of 44,174 square miles, or approximately one third the total area of the state. The district is under the supervision of the President of the Commission, Mr. F. M. Newbert.

Feed Conditions and What They Make For.

The abundance of fish, game, birds or animals in a wild state is determined largely by the quantity and character of food that nature provides. The counties of the Sacramento District are particularly favored in this respect, furnishing an abundance of the foods necessary for fish, animals and birds. The skilled deer hunter goes to the range or mountain hillside where the browsing is abundant, for there he knows the deer will surely be, especially in the early morning feeding time and during the dark of the moon. Likewise, the duck hunter who is experienced will prospect the lakes and ponds before the arrival of the ducks, geese, etc., from the far North for indications as to the supply of the rich grasses, seeds, roots and bulbs most sought by water fowl, well knowing that upon these depend the appearance and stay of birds in this locality. The higher altitudes of this district furnish a great supply of wild fruits, berries, seeds, bugs, grasshoppers, etc., of which sage hens, grouse and mountain quail are very fond. That portion of the Sacramento and San Joaquin delta before the era of reclamation was a veritable paradise for wild fowl, and to a great extent still furnishes a food supply for a large number of ducks, geese, swan, sandhill cranes, and other water fowl. All the reeds, seeds, bulbs, and succulent water grasses, except wild rice, known to the Eastern and Middle States and classified by the Department of Agriculture grow in the greatest luxuriance. Many varieties of roots and grasses which I am unable to identify are also much in evidence. The most important of these duck foods are the two varieties of what is known locally as "tule potatoes,"

or bulbs and classified as *Sagittaria latifolia* and *Sagittaria arifolia.* The next in importance perhaps is the wild celery seed or bean, *Vallisneria speralis.* The writer once killed a canvasback with forty-one of these beans in its gullet. Ducks arriving in poor condition on these feeding grounds will get quite fat in a few days. The most plentiful is the tuber, known as the *"wapata."* These tubers grow in such quantities in the Sacramento delta that many tons are annually dug by Chinese and shipped to San Francisco for the Japanese and Chinese, by whom they are highly prized for food. There is the wild millet, the sago weed, what is known locally as gray duck food, perch grass weed, what is known as the yellow lily pad (*Nymphæ flava*) seed, which is very abundant in some localities and furnishes a great amount of food, especially favored by wood ducks, and many other seed bearing grasses, too numerous to mention.

The variety of food on which wild ducks feed depends entirely on the depth of water. All the deep water or sea ducks are able to procure their food at from one to ten feet of water, while the waders, mallard, sprig, teal, etc., feed on what can be obtained in shallow water, at from a few inches to two feet, or on what remains on the surface after being pulled loose by the diving ducks. Wild celery has been introduced in several parts of California, but so far with little success, owing, no doubt, to a lack of knowledge of the conditions necessary to insure its successful growth. Circular No. 81 issued by the Bureau of Biological Survey, U. S. Department of Agriculture, gives valuable information as to planting of this seed. Some objection has been raised to the introduction of this seed into California owing to the fact that carp are very partial to it, but there are many varieties of native seeds and grasses which may be successfully planted that carp can not destroy, as is shown by the large crops of duck feed found where carp are abundant. Many of these seeds, roots, etc., may be obtained in the fall of the year, especially from the territory bounded by Cache and Miner sloughs and the Sacramento River. The amount of reclamation being done in overflowed lands will necessitate the planting of this wild feed in waters barren of such seed. Wild ducks demand other feed besides grain as fed by some gun clubs. Of the cultivated grains, mallard and sprig show a preference for cultivated rice.

Fish and Game of the Sacramento Administrative District.

In describing the varieties of game to be found in this district it is not my intention to undertake an analysis or classification of species, etc. I will describe only those which have come under my observation in thirty years' experience in much of the territory under consideration, as well as under the observation of the old hunters and deputies of the Fish and Game Commission.

The classification of the different varieties of deer, bear, etc. is as yet incomplete and largely matters of personal opinion not yet settled. I have seen a female black bear with a black and brown cub and a brown bear with two black cubs. What should concern us most is that a bear, deer or other animal of any kind is a valuable asset to California. I care nothing for the resemblance of one species of deer to another species as long as it is a deer and a good deer. All deer are beautiful and, unfortunately for them, are considered desirable game and good for food.

Large Game Animals.

Numerous varieties of game animals are peculiar to this portion of California. In some counties their numbers are increasing, on account of the wise legislation protecting these animals, and the vigorous prosecution of violators by the Fish and Game Commission, with the cooperation of the prosecuting officers of the several counties. Public spirited citizens have realized what a great asset the fish and game are to the state. It is a magnet which draws the people to the mountains with gun, rod or camera, and is an incentive for outdoor life and health. Remove the fish and game and that incentive will no longer exist.

Deer are to be found in all the twenty-one counties of the Sacramento District; the counties containing the greatest number are doubtless in the eastern and northern part of the state. Along the northern line may be found the large mule and black tail deer, while in the eastern portion may be found the black tail and, occasionally, the large white tail. It is claimed there are other species of small deer, known locally as chemise and chaparral—deer which do not attain a large size are to be found in Nevada, Placer, El Dorado, Amador, Glenn, and Colusa, or at an elevation generally at from eight hundred to thirty-five hundred feet.

Space will not permit giving the various localities where fish and game most abound. There are many booklets issued by the several railroads and various promotion bodies that may be had for the asking. All are reliable and written by authorities who know the game by experience.

From reliable information it seems that the remnant of the antelope in Siskiyou County are increasing in number. There are about three hundred in several bunches, seventy-six being counted recently by one of the commission's deputies in that county.

The elk liberated in Shasta County are increasing; a number of calves having been seen recently. These two last named animals are protected by stringent laws, as are does and spotted fawns of all our deer.

Black and brown bear are numerous in portions of Siskiyou, Modoc, Lassen, Trinity, Tehama and Shasta counties. From reports a few grizzlies still remain in Trinity and Siskiyou counties, together with a large number of smaller mammals, some of them highly predatory.

Upland Game Birds.

Among the feathered and furred game of the upland or mountain are to be found the blue grouse, sage hen, and mountain quail. At a still lower altitude, from sea level up to three thousand feet, may be found anywhere the valley blue quail, possibly the grandest game bird in the world. He will put to the test the nose of the trained pointer or setter

Marble Mountain in western Siskiyou. A great game country.

and the eye and nerve of the hunter as no other game bird can—a game bird in all that the word implies—and always capable of caring for himself under any and all conditions.

The wild or band-tail pigeon is yet in evidence at some seasons. This bird is now protected by federal law.

Rabbits of several varieties, as the jack rabbit, the red hare, cottontail, bush rabbit, and the gray squirrel are numerous in many sections.

Group of Waterfowl.

Of the migratory game and waterfowl, classed as such under the federal regulations, although many are habitant to California, are the mallard, sprig, gray duck or gadwall, widgeon or ballie, spoonbill, blue wing, green wing and cinnamon teal, wood duck, canvasback, redhead, blue bill, black jack, ruddy duck or wire tail, and many other small varieties, coot or mudhen, etc. Of geese, there are the honker or Canada goose, the big brant or Mexican, one of the smaller size and the lesser brant or yelper, two white or snow geese, the large and small, the speckled breast or gambel goose, also a large gray goose resembling the gambel goose, but much larger, weighing as much as ten pounds or

more; local name tule goose. This goose is devoid of the large black feathers seen in the breast of the gambel at any age. It has a different call or cry, and is easily decoyed by call. This goose and one of the brant are not described or identified by any one, as far as I can ascertain.

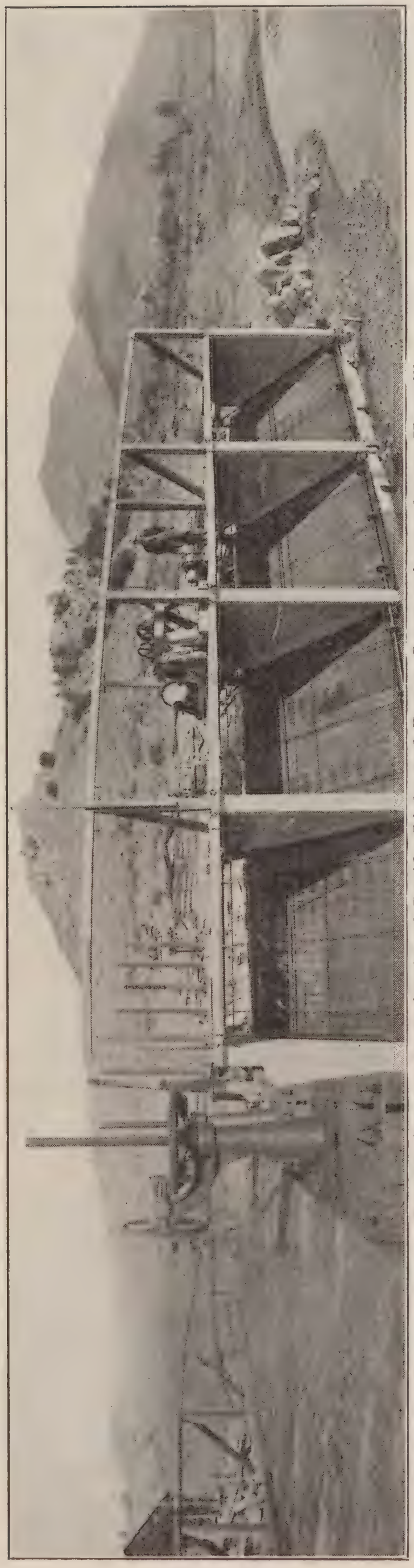
There is the white swan, the sandhill and other cranes, nearly all the shore birds, the king of all, the Wilson or English snipe, which, with the yellowleg and robin snipe, are most abundant of all. There are golden, black-breasted, ringneck, bullhead and other varieties of plover, snipe, sandpipers, ibis, curlew, stilt, avocet, herons, bittern, mergansers, terns, loons, divers, grebes, pelicans, cormorants, etc.

Waterways and Fishes.

The Sacramento District possibly furnishes a greater mileage of streams and a larger acreage of lakes capable of sustaining fish life than any other like territory. In this district there are said to be 14,500 miles of streams, besides 400,000 acres of lakes, nearly all the habitat of some varieties of fish. The higher regions are the homes of the black spotted, rainbow, Loch Leven, eastern brook, dolly varden, mackinaw and other trout. Many of the upper lakes have been stocked with the gamey large and small mouth black bass. The rivers, lakes and creeks at a lower altitude also furnish the angler with the finest of black and striped bass fishing.

The Sacramento River, being the highway of the quinnat salmon between the Pacific Ocean and the spawning grounds on the numerous cold streams of the tributaries of the Sacramento, is, during the running season, filled with the choicest of salmon, shad, striped and black bass. The introduction of foreign fish into our waters about two decades ago has proved a grand success. These are the shad, striped bass, two varieties of catfish or bullheads, crappie, blue gill, yellow or ring perch, black bass, both of the large and small mouth varieties, besides the large variety of fish native to our rivers. The sloughs tributary to the lower Sacramento and San Joaquin rivers, in Yolo, Solano, San Joaquin and Sacramento counties, afford striped and black bass fishing unsurpassed anywhere. Striped bass are frequently taken with rod and line weighing as high as forty pounds, while black bass of nine pounds are common. The striped and black bass have both penetrated the upper tributaries of the Sacramento River. They are now found two hundred miles up stream from Sacramento city, being especially abundant in season in the American, Feather and Yuba rivers and smaller tributaries. Fortunately, their zone ends where the trout waters commence.

Altogether, the twenty-one counties of the Sacramento District afford the rarest opportunity to the naturalist, the ornithologist and ichthyologist. Should this territory not satisfy him, then he is hard to please indeed.



Parallel bar screen at intake of Pacific Light and Power Company's canal near Kernville.

Piute Creek (San Joaquin River watershed). Planted with Golden trout in 1914.

FRESNO DIVISION.

General Conditions and some Important Problems.

By A. D. Ferguson, Assistant Commissioner.

Fish in the Valley Streams.

The fishing conditions in the valley section of the Fresno Division are at once important and peculiar. Important, for the reason that many thousands of people in all walks of life, coming from grain ranches, farms, hamlets, and the larger cities, find throughout the fishing season pleasure and recreation along the banks of the two great rivers of the valley. Peculiar in that, due to the diversion of the waters for irrigation purposes, both the San Joaquin and Kings rivers are dry throughout a portion, at least, of their lower courses, almost every fall.

In addition to this natural hazard, two fruitful causes have militated against the existence of fish life in these rivers, to wit, the operations of market fishermen and the absence of screens across the inlets of the various irrigating canals. It would seem hopeless to expect good fishing at any time under such conditions as prevail in these two rivers, and it speaks volumes for the prolificness of these waters that a reasonable supply of fish life has been maintained from year to year. The first of these two chief causes for the destruction of whatever fish life can exist under the natural conditions, has been partially overcome by the action of boards of supervisors in some of the valley counties in forbidding, by ordinance, the use of seines or nets in the taking of fish. The screening problem is now in process of adjustment, through the activities of the Fish and Game Commission.

Effects of Market Fishing.

The Fourth Fish and Game District embraces all of the waters of the valley section south of the San Joaquin County line. The interest of the people in fishing conditions in the local waters is almost universal, and to them the fish are an important and valuable natural resource, not as affording opportunity for a commercial industry, but as an object of pleasurable pursuit and offering an incentive to many outings. Certainly, the waters of the Fourth Fish and Game District are not of sufficient magnitude to maintain a commercial industry of any importance, and if left to their own devices, the market fishermen, while their number is comparatively limited, can, by reason of the fact that the fish during the low water period are congregated in a comparatively few holes and pools, easily capture all of the fish life in these waters. Nor is the damage confined alone to the low water season. The drawing of seines for the purpose of taking even the less valuable fishes, such as

carp, works destruction to the future black bass supply by disturbing or destroying the nests of the bass. Hence no form of commercial fishing can be indulged in in these waters without working injury to the general fish supply. Up to the time when some of the valley counties undertook to conserve the fish supply by passing ordinances forbidding the use of seines and nets in the taking of fish, all of the indigenous fishes were in imminent danger of speedy extermination. The counties of Kings, Tulare, Fresno, Merced and Stanislaus have passed anti-seining ordinances, and the effect has worked great good in those counties whose ordinances have been longest in existence. But since the validity of county ordinances for the better protection of fish and game has been seriously questioned, there should, by all means, be a state law enacted forbidding the taking of any variety of fish at any time by means of seines, nets or traps of any description. The passage of such a law would not displace an industry of any commercial importance. As a matter of fact, the total revenue derived by the state from the sale of commercial fishing licenses in the whole Fourth Fish and Game District is less than $400. On the other hand, while working incalculable benefit to the people of the Fourth District, the cessation of commercial fishing would permit of many salmon reaching the spawning waters of the upper rivers and thus much good eventually be done the general commercial fishing industry of the state.

Screens.

The destruction of fish life in the many irrigating canals has been a serious drain upon the general supply. In the spring of the year the fish descend these canals in large numbers, probably in search of food, and when the canals are turned dry in the fall the annual destruction of fish life is appalling. Until the year 1913, no demand had been made by the Fish and Game Commission for the installation of screens across the inlets of the canals for the reason that no adequate screen had been devised which would effectively exclude fish from the canals without seriously interfering with the flow of water. Recognizing the prime importance of the horticultural interests, the commission was loath to take any action which might possibly stop the flow of water in the canals, since not only the material prosperity but the very existence of the population of the valley depends upon the irrigating water. It should not be understood, however, that the matter had, in the interim, received no attention by the commission. Many experiments were tried looking to the securing of an adequate screening device, particularly in the Fresno Division. Mr. W. H. Shebley, Superintendent of Hatcheries, and members of his staff, have succeeded in perfecting a parallel bar device with an automatic cleaning attachment which is thoroughly adapted to the purposes for which it was intended. The important

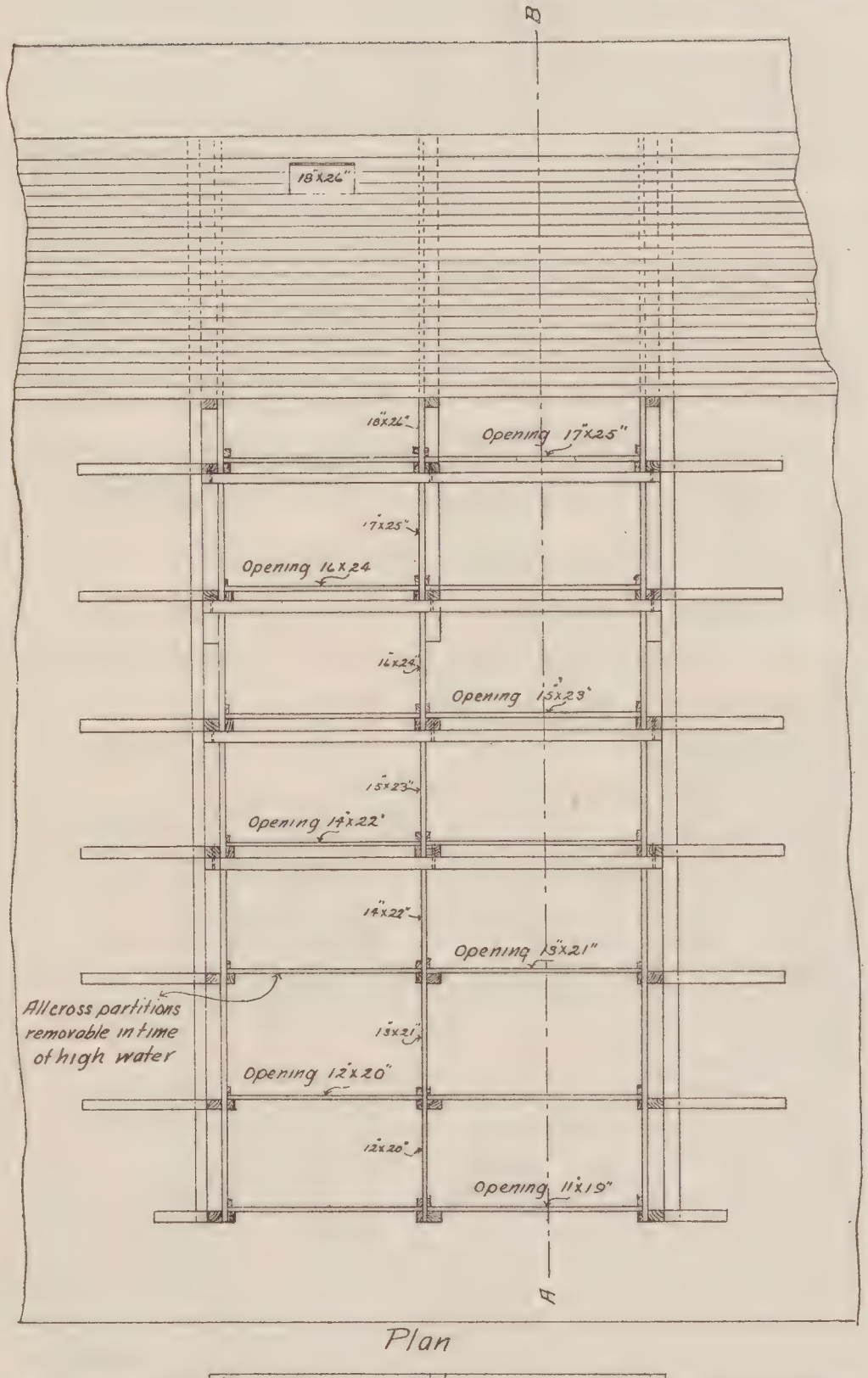
departure, and the successful feature, of the new device, is the dropping of the mesh screen and the substitution of parallel bars of $\frac{1}{16}$ inch by 1 inch galvanized iron, bound together in sections by means of stay rods, and the proper opening between bars secured by the use of burrs between the bars. The space between the bars is usually one fourth of an inch. It has been proven that this type not only offers less resistance to the flow of water but also has no tendency to choke up with trash and slickens as is the case with square mesh screens. This device has the further advantage of being easily cleaned, in contradistinction to a mesh screen, for the cleaning of which no adequate device has ever been found. An automatic cleaning device has been perfected by Mr. R. W. Requa of the hatchery force. This device involves the use of angle iron rakers attached to sprocket chains which are driven at slow speed by sprocket wheels set on shafts top and bottom at both ends of the screen. The mechanism can be driven either by a small electric motor or by a waterwheel set in the canal itself. The angle irons drag over the face of the screen and carry off any trash which may have collected thereon. The total displacement of water by this type of screen is about 8 per cent; hence, in order to permit the passage of water through the screen without increasing the pressure, it is necessary only to place the screening device in such position as to occupy 8 per cent more of the river channel. In practice, canal companies usually allow a somewhat greater percentage for displacement. This type of screen is being rapidly installed throughout the division, and the ultimate effect upon the fish supply will be highly beneficial; for although the lower waters of these rivers may go dry, yet above the point of last diversion of water there will always be sufficient living water in the river channel to carry a sufficient number of fish to perpetuate the supply.

Fishways.

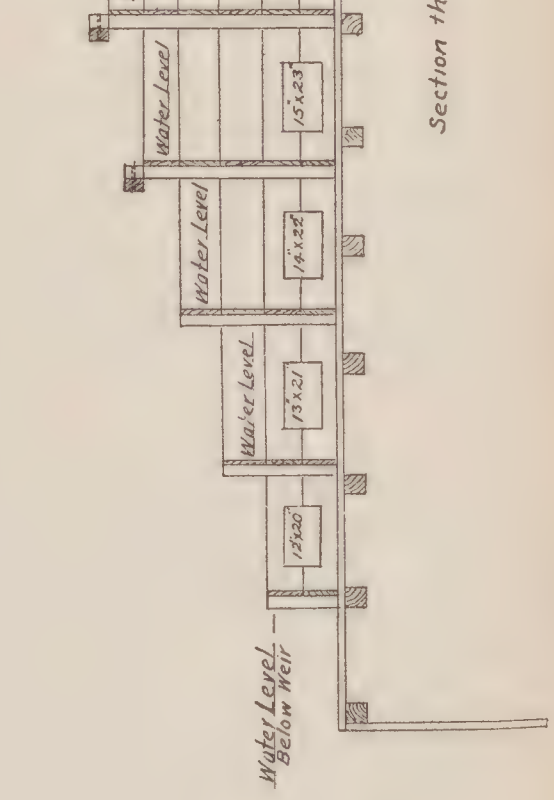
The problem of providing fishways upon the diverting dams and weirs of these rivers was also unique. Although artificial fishways have been in use for three hundred years, all of the various types of fishways heretofore used have had to do with dams having a permanent level, such as concrete and masonry dams. But in the rivers of the San Joaquin Valley the prevailing type of weir provides for a varying height. The canal inlets are usually constructed to receive water at what may be called a mean high water level. The water level at the inlet of the canal is maintained by raising or lowering the height of the diverting weir. To accomplish this, removable boards called "flash boards" are inserted or removed in the face of the weir. Thus it may happen that the actual height of these weir boards may vary several feet in a day. No type of fishway heretofore invented could be made to conform to this condition of varying levels. To meet the situation, an entirely new type of fishway was evolved, after many experiments, by

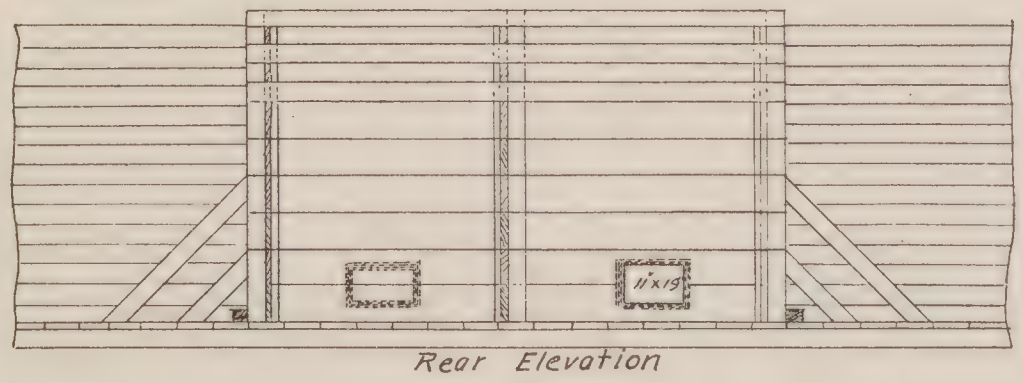
Messrs. Ernest Schaeffle, executive secretary of the commission, and Deputies E. W. Smalley and A. D. Ferguson of the Fresno Division. The construction of this fishway, now called by the Fish and Game Commission the "Kings River fishway," is shown by the following drawing.

Plan of
Kings River Type
FISHWAY
Showing typical installation in a weir
eight feet from floor to crest
Scale 1/4 inch = 1 foot.



Plan





Rear Elevation

The principle involved is, that the pressure in any of the openings in the bottom of the fishway between compartments is equal only to the hydrostatic pressure of a column of water whose height is the difference

between the water level in one compartment and the water level in the next compartment above; the same being true of the last compartment and the river level itself. This permits ascending fish to pass through the dam on the bottom level of the stream instead of passing *over* the dam as in other fishways. This regular procession of increased water levels in each succeeding compartment is secured by reducing the dimensions of each outlet opening. The evolution of the Kings River type of fishway is somewhat interesting. Starting with the theory that if a succession of single compartment pools, each one foot lower than the other, were constructed in such manner that if a small volume of water were permitted to overflow from the river into the first and thence into the succeeding pools, and if an opening were cut in each of the pools flush with the bottom of the river, then, so long as there was an overpour from one pool to the next, the pressure in the bottom openings would be equal only to the hydrostatic pressure between pools —in other words, a column of water one foot high. By experiments it was demonstrated that if each pool were divided by a lateral partition into two pools, and an opening of the same size as the other bottom openings were cut through this partition, the pressure in the openings could be further diminished. This led to the further experiment of decreasing the size of the outlet bottom openings one inch in each dimension in a regular ratio between each set of double compartment pools, leaving the opening in the lateral compartment the same size as the inlet opening next above. The result proved that the desired difference of water levels between the compartment pools could be maintained without any overpour from the river, and without increasing the pressure in any of the fishway openings. The velocity of the water in passing through the openings in the pools in this type of fishway does not exceed four feet per second, and this permits of the passage of even the most sluggish of fish through any weir, no matter what its height. There is practically no limit to the possibilities of this type of fishway. On extremely high dams, it would become only a matter of expense. On board weirs, up to a height of twenty feet, the expense is comparatively trifling.

Tulare Lake.

Tulare Lake has always been an important factor in the conditions affecting fish life in Kings River waters. To a lesser degree this is also true of the Kaweah and Tule rivers. After a succession of wet years, this large, shallow lake, approximating twenty by forty miles in area, has afforded a haven for vast numbers of Sacramento perch, catfish, black bass, Sacramento "pike," and many fishes of minor value. With the advent of the spring freshets the fish of the lake have annually migrated to their spawning grounds in the streams which feed the lake. Nowhere else in the state have Sacramento perch and catfish been found

in such numbers and of the size of these Tulare Lake fish. Unfortunately, the dry seasons of 1912 and 1913 were accountable for the almost total disappearance of what had once been a lake of large proportions. With the drying up of the waters of the lake, hundreds of tons of valuable food and game fishes were destroyed. In this year, 1914, a large volume of water has been poured into the lake, which will make it again a sea of water of considerable size and importance. But its future existence depends upon two factors; *first,* a succession of wet seasons; and, *second,* whether or not the flood waters of the feeder rivers, particularly Kings River, shall be diverted from the lake and thrown into the San Joaquin River in order that the lake bed may be reclaimed for agricultural purposes. Very naturally, since the bed of the lake, when dry, is agricultural land of wonderful possibilities, it is but a question of time when all or practically all of the lake bed will be reclaimed by the agriculturists. Already, a great drainage channel is being constructed which, while primarily intended to reclaim other lands, will have a tendency to divert the flood waters of Kings River from the lake to the San Joaquin River. While the effect of this will preclude the return of the old-time favorable conditions for fish life at the same time it will not be without its compensations. The setting up of a well defined current from Kings River into the San Joaquin will undoubtedly attract a run of salmon, striped bass and possibly shad, into Kings River. It is worthy of being recorded that this reclamation work is already responsible for a noticeable run of salmon from the San Joaquin into Kings River. Prior to the year 1911, salmon did not enter Kings River, due to the fact that although the two streams were directly connected, there was no perceptible current for many miles throughout the swamp and overflowed section lying between the San Joaquin River at the mouth of Fresno slough and Summit Lake, which was once the dividing line where part of the waters of Kings River discharged toward the San Joaquin, while the rest of the Kings River waters flowed into Tulare Lake. In the spring of the year 1911, due partly to the partial confinement of these Kings River flood waters into one channel, and partly to the fact that the Miller & Lux dam checked the current of the San Joaquin River for a considerable distance above the dam, a few salmon, confused, no doubt, by so much still water, found their way into the connecting channel of Kings River and thence into Kings River as far up as the town of Laton. The following year, for the first time, a very considerable run of salmon actually entered Kings River and ascended the stream to a point at least as high up the river as Trimmer Springs, being some 125 miles from the point where Kings River enters the San Joaquin channel. In 1913, due to the dry

season, no Kings River water entered the San Joaquin River, but in June of this year a very considerable run of salmon again appeared in upper Kings River.

Food Value of the Fish.

While the value of the fish life in the rivers of the Fourth Fish and Game District is chiefly in the opportunities for sport and pleasure offered the population, at the same time the food value of these fishes is not inconsiderable. In the favorable fishing season of 1911, the waters of lower Kings River were literally alive with catfish, Sacramento perch and black bass. Hundreds of people from points within a radius of fifty miles of the river, taking advantage of the presence of such large numbers of fish, took, with hook and line, not only enough fish for their own immediate needs, but often fish in quantities for distribution to their neighbors. At the weir of the Empire Land and Water Company near Tulare Lake, a daily average of 400 to 500 persons fished from the banks of the river for a period of two months. Whole families were camped there from Friday evening until Monday morning and every one apparently was able to take, with hook and line, all of the fish which they could carry away with them. While black bass and Sacramento perch were plentiful, catfish largely predominated. These catfish so caught were from two to twelve pounds weight, and it was estimated by deputies of the Fish and Game Commission, who were constantly stationed at that point, that in two months from one half mile of the river waters, 150 tons of catfish alone were taken with hook and line.

The Future Prospect.

Although the unusually favorable condition last described probably never again will obtain, at the same time it is possible, by the stoppage of commercial fishing, the screening of the canals and the establishment of practical fishways, to restore and maintain, for a great many years, a high degree of excellence of fishing conditions throughout all of the lower waters of the rivers of the Fourth District. A new factor must, within a few years, enter into the general situation. It is more than probable that great storage reservoirs will be constructed to impound the flood waters of the more important rivers. The trend of public opinion seems to be that while impounding the flood waters of these rivers for the purpose of providing a regular and sufficient flow of water for the irrigating canals, the navigation interests shall also be considered. No doubt the flood waters can be so conserved and distributed that a regular flow can be maintained sufficient not only to provide water for all of the irrigating canals, but to provide a perpetual flow throughout the whole length of the river channels. The beneficial effect on fish life of such a system, should it ever be inaugurated, is apparent.

Water Diversion for Power Purposes.

Whatever may be said of the necessary sacrifice of fish life in the streams of the valley section by reason of the diversion of water for irrigation purposes, the situation is different in control and in principle with regard to the streams of the Sierra Nevada Mountains. In the valley section, the water diverted from the streams by means of irrigation canals is spread upon the land and does not return to the streams, but the water thus diverted is necessary to the very existence of the population. In the mountains, water is usually diverted for the purpose of developing electric power, and returns eventually to the natural channels. Here, since the water is not lost but diverted and returned to the channels, the problem of conserving the fish life in the streams is simple in principle, but even more important than the similar problem in the valley section, because, with proper regulations, the fish life can be forever perpetuated; while it is conceivable that the time may come when all of the lower waters may be used for irrigation. Nor does the principle of the greatest good to the greatest number apply alike to the use of water by irrigationists and power companies. In the first instance it amounts practically to a public use of a public resource. Irrigating canals in the San Joaquin Valley are operated under legally organized irrigation districts, cooperative companies of horticulturists or by public service corporations selling water, usually, to holders of water rights whose money actually dug the canals. Thus, in any event, the ownership of the land and the use of the water are intimately related; while in the second instance the enterprise is wholly commercial. The capital invested bears a different relation so far as the public is concerned, and while power companies are public service corporations, the electric power developed by the diversion of the stream does not necessarily make for the benefit of the people who live adjacent to its banks. As a matter of fact, the biggest power projects in the Sierra Nevadas were inaugurated for the purpose of developing electricity to be carried on wires, entirely away from the San Joaquin Valley.

The problem, then, of water diversion for power purposes with relation to its effect on fish life, may be safely treated as separate and distinct from the diversion and use of the same water after it reaches the valley section.

The effect of water diversion for power purposes, presents many complications. For instance, and, illustrating from actual conditions, if a comparatively small percentage of the minimum flow of a natural trout stream is diverted, no harm results. If a storage reservoir is constructed across the head of a precipitous, rocky gorge, which naturally presents a series of falls impassable by fish and after being used to generate electric power, the water is returned to the channel at a point more favorable for the existence of fish, great good has been

done to the fish interests. For while the fishing waters destroyed by the diversion of the water from the section of the stream where conditions for the existence of fish life are not good, is negligible, the lower section of the channel is not affected, and the storage reservoir, if large, will support infinitely more fish life than could have existed in many miles of the stream under natural conditions. Again, if all of the minimum flow of a minor stream is diverted at a point which practically marks the limit of the downward migration of trout, and which is above the limit of the upward migration of the fishes of the lower river, no great amount of harm has been done. But throughout the mountains there are trout waters of such importance that the public interests will be irreparably damaged if a considerable portion of the channels of such streams were to be dried up because of the diversion of water for power purposes. And such streams, by reason of the fact that they occupy the bottoms of deep canyons where erosion has reduced the fall of the stream to comparatively slight proportions, if diverted for power purposes, will not be returned to the original channel for many miles. The development of power by falling water in our mountains is simply a question of contours. If water is diverted from a stream at the head of a succession of falls or rapids, and carried in conduits nearly on a contour level, it need not be taken a very considerable distance until it shall have attained a level a thousand feet or more above the bed of the stream. Naturally the largest streams occupy the deepest canyons where the grade is the slightest; hence, the water diverted from such streams must be carried a great distance before it will have attained a height above the canyon floor sufficient for the purposes of developing a large amount of hydroelectric power. And naturally, too, those who would develop hydroelectric power are attracted to the streams carrying a large volume of water; and therein is the menace to the people's interests, since such streams carry the greatest amount of fish life. Typical instances of this, the most important condition, are found in Kern River from Kernville upward; in Kings River from Redhill upward, and including its main branches; and in the San Joaquin River from the town of Friant, almost to the sources of the main branches of the said stream. These rivers and their main feeders teem with fish life, and are among the most important trout waters of the state. The fish which abound in these waters are not only a resource of great immediate importance to the people of California, but are of potential importance impossible to measure in figures of dollars and cents. In all reason, this fish life must be conserved.

That the fear that the waters of such typical streams may be diverted to the detriment of the fish interests is well grounded, is evidenced by the fact that on Kern River above Kernville, preliminary construction

work has already been started to divert, by a large ditch, Kern River water for power purposes. Apparently no storage reservoir is provided for, and if the interested power company is permitted to divert all of the minimum flow of the river, the fish life in sixteen miles of what is now one of the finest trout streams in the state will be destroyed. Although the maximum flow of Kern River at the point of this proposed diversion is several thousand second feet, yet the minimum flow recorded on the government gauge in 1913 was 334 feet for a period of about ten days. It is quite conceivable that a hydroelectric plant would require all of this minimum flow if a full degree of efficiency were

Kern River near Fairview.

to be maintained. Furthermore, it is generally understood that engineers have, at the behest of a power company, made surveys which contemplate the diversion of Kern River water still thirty miles above the intake of the proposed diverting ditch last named. If this were the only important trout stream threatened, the situation would be serious enough, but unfortunately it is more than possible that in the race for hydroelectric power development throughout the Sierra Nevada mountains, similar projects will be undertaken on other equally important streams and on a scale of such magnitude as to make difficult the obtaining of sufficient water for the power plants without taking all of the minimum flow of the streams.

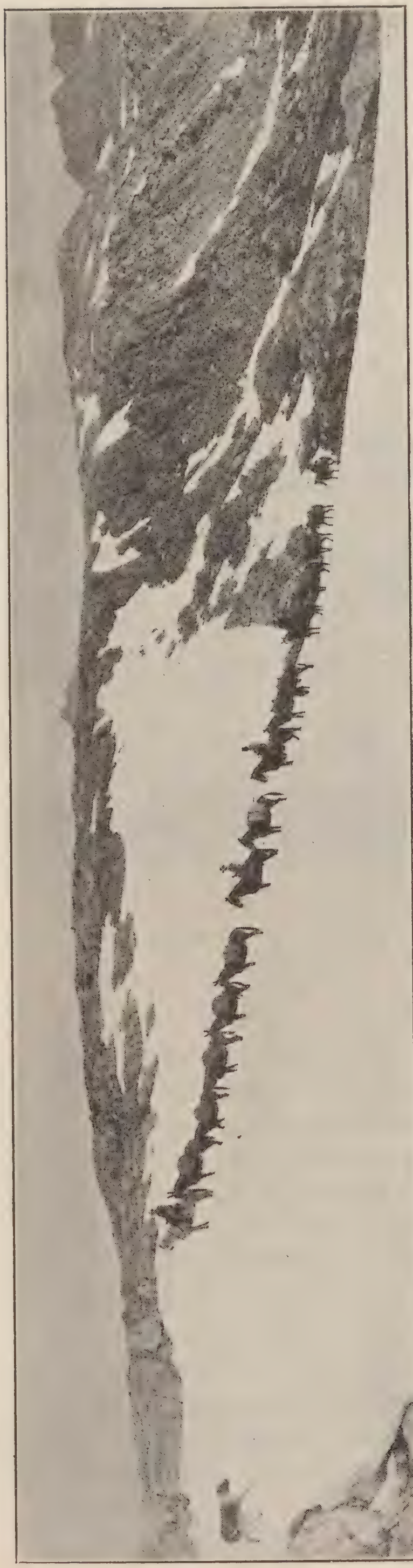
To meet the situation, the Fish and Game Commission will insist upon the strict observance, in spirit as well as in letter, of the law compelling the installation of fishways upon all dams. The law requires that the owners or occupants of all dams or artificial obstructions in all rivers of this state, naturally frequented by migratory fish, must construct and

maintain durable and efficient fishways in accordance with the plans and specifications as determined by the Fish and Game Commission, and such fishways must be kept open to the free passage of fish at all times. Ten per centum of the minimum flow of a mountain stream passing through a fishway might be sufficient to permit the free passage of fish throughout the stream channel below the point of water diversion, and thence over the obstruction. The matter is so important that the right of the people to insist upon the preservation of the fish life in our mountain streams, must be jealously guarded, and if necessary, more firmly established by further legislative acts. The principle should be fixed by law, that there must at all times, in all trout streams, be a sufficient minimum flow of water passing any diverting dam or intake canal to insure the perpetuation of the fish life from the point of diversion to the point where the diverted water is returned to the natural channel.

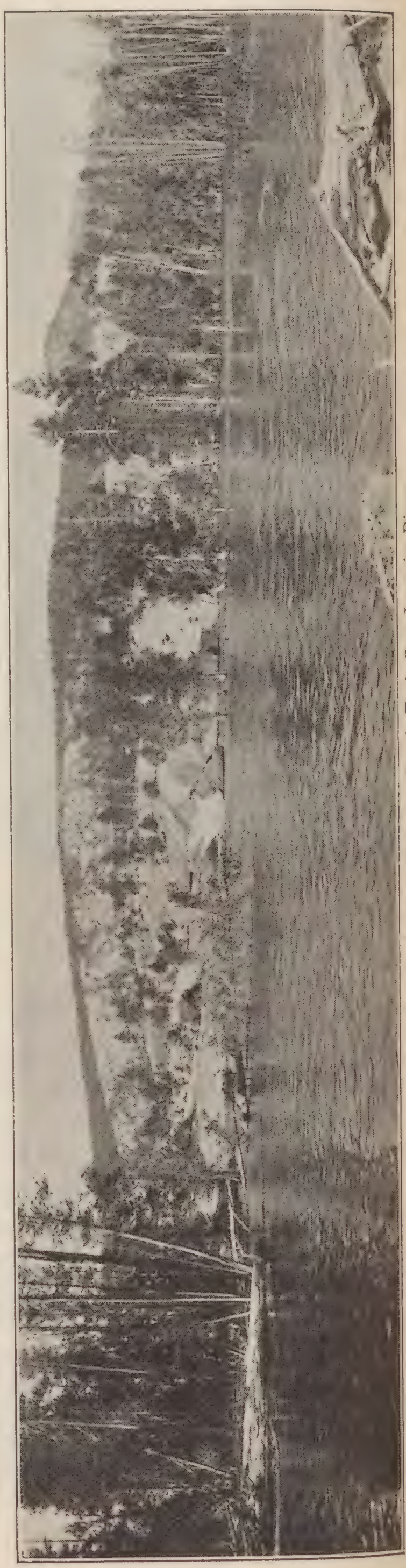
It must not be taken for granted that a law to provide for the absolute protection of the fish life will prevent or seriously interfere with hydroelectric power development in the state. When the percentage of the minimum flow of any stream which must be permitted to remain in the channel is fixed by law, engineers, in figuring on the development of a certain amount of hydroelectric power, will plan either to store by reservoirs a sufficient amount of the flood waters of such stream to provide a constant minimum flow, or will plan a succession of power house sites at descending levels along the course of the stream the waters of which are to be used. It will then become a question of expense. But the people's rights are supreme in all instances and such expense should be taken into consideration by the projectors of future hydroelectric enterprises.

Trout Planting.

The work of reaching and planting, with desirable varieties of trout, the barren waters of the higher mountains, progress in which has been set forth in previous biennial reports, has been consistently carried forward. It would require a study of a topographic map of the mountain region to obtain any adequate idea of the magnitude and importance of these operations. As stated in previous reports, only those few main channels which occupy the beds of deep canyons in the Sierra Nevada Mountains, where no impassable fall exists between the point where the trout are found and the ocean, naturally contained any fish life. The feeder waters of this vast watershed, coming into the main channels over high and impassable falls, were naturally devoid of fish life of any kind. To reach and plant with desirable varieties of trout, these barren waters, has been the fixed policy of the Fish and Game



Fish and Game Commission's 20-mule pack-train crossing Piute Pass. Elevation 11,400 feet. Train carrying Golden trout.



A pool below Jackass Falls on South Fork San Joaquin River.

Commission since the organization of the Fresno Division. Since there are no wagon roads in existence, the transportation of trout involves packhorse distribution. With surprising celerity the public has discovered the fishing thus established in previously little known streams, and many thousands of people from the adjacent valleys now annually visit, in pursuit of pleasure, streams which, until placed there by the commission's deputies, contained no fish life. Nor are the streams alone important. In the higher mountains of the Fresno Division there are over 1,000 lakes and lakelets, most of which are adapted to the existence of fish life. A great many of the more accessible of these lakes have already been reached and planted with rainbow, Loch Leven and Eastern brook trout. In the watersheds of the Kern and Kings rivers a great many lakes, too, have been reached and planted with adult golden trout. Following the original plan, other lakes of the summit region are now being reached as fast as possible and stocked with none but golden trout. The close of the season 1914 will mark the extension of the range of the golden trout northward from their original habitat in the Mount Whitney region more than 100 miles. Cut off by high falls from the lower waters where other varieties of trout have been planted, the golden trout now being established in the summit region will remain true to their type, since no opportunity will be afforded for interbreeding with other varieties. For future reference, it is here recorded that in these golden trout operations only the golden trout of Volcano Creek, *Salmo roosevelti* (Evermann) are being used as stock fish. Two other varieties of golden trout, to wit, the *Salmo agua bonita* (Jordan) and *Salmo whitei* (Evermann) are recognized by the authorities, but lest confusion should arise in identifying these transplanted fish in future years, only the Volcano Creek fish are used in the commission's operations.

The details of the fish planting operations of the Fresno office during the season 1913, are set forth in the following copy of a report filed at the close of the season. This report deals only with the planting of barren waters by the Fresno office of the Fish and Game Commission. Several hundred thousand trout fry were distributed to public spirited applicants throughout the Fresno Division, to be used in replenishing the supply of trout in the more accessible, and consquently over fished streams.

Fish Planting Report, 1913.

FISH AND GAME COMMISSION,
San Francisco, California.

GENTLEMEN: I have the honor to report the season's fish planting operations of this division, as follows:

In the month of August (16th to 29th), Deputy W. G. Scott of Tuolumne County, assisted by William Guinn, with seven pack animals, undertook, and carried on to a successful conclusion the stocking of some important lakes in the mountains of

Tuolumne County. Adult stock fish of the rainbow trout variety were used in Deputy Scott's operations. Deputy Scott was compelled to take his supply of stock fish with hook and line. Fishing with "flies," the deputy and his assistant first took 250 rainbow trout ranging from eight to twelve inches in length, from the stream at Lord's Meadow near the Yosemite National Park line, and thereafter planted them in Deer Lake and in Big Lake above Piute Meadows. These lakes, which are about fifteen miles from Strawberry station, are of large size and excellent spawning water is afforded by a stream which flows through both lakes.

In accordance with a mutual understanding between Major William T. Littebrant, Acting Superintendent of Yosemite National Park, and this office, whereby, at Major Littebrant's request, we agreed to do some trout planting in the back waters of Yosemite National Park, Deputy Scott next transferred his operations to the vicinity of Wilmer Lake within the park boundary. Major Littebrant showed the party many courtesies, which are hereby acknowledged. Taking adult rainbow trout for stock fish, as before, Deputy Scott stocked Dorothy Lake at the head of Jack Main's Canyon, and Mary Lake, some five miles above Tilden Lake, stocked last season; both within the park boundary. Dorothy Lake and the stream in Jack Main's Canyon promise to be some of the best fishing waters within a large section of the Sierra Nevada Mountains. Deputy Scott was greatly hampered in his operations by reason of many severe electric storms. The deputy was himself, once shocked into unconsciousness by lightning which struck a tree near where he was working while taking up fish. He was alone at the time, and has no idea of the length of time he was unconscious, but believes it was for a considerable period, since all of the fish in a can which he was carrying were dead when he recovered consciousness. Added to the fish planting work previously reported in former years, the Tuolumne County section of the mountains will soon afford splendid fishing opportunities for the constantly increasing number of people who seek that section as an "outing" ground. There remains to be stocked, some back waters, both lakes and streams, which waters we have reserved to be planted with golden trout, in accordance with the established policy of this division.

* * *

Our packhorse distribution fish work having been confined, in 1912, to stocking the barren waters of the mountains of Madera and Tuolumne counties, and the work of distributing rainbow, Lock Leven and Eastern brook trout being well advanced throughout the division, the major effort in fish planting work this year was devoted to transplanting golden trout to suitable waters in the mountains of Tulare and Fresno counties. Accordingly, on July 30th, Deputies S. L. N. Ellis and E. W. Smalley left Big Meadows in the mountains of northern Tulare County, with a splendidly equipped pack train, to carry forward the programmed transplanting operations in the watershed of the upper Kern River. En route, they stocked Moose Lake with Lock Leven and Eastern brook trout taken from Weaver and Jennie Ellis lakes, which lakes were stocked by this office with Lock Leven and Eastern brook fry in 1911. Both varieties have thrived in the two lakes mentioned to such a degree that a supply of stock fish was readily secured by the use of "flies." The Lock Leven trout used for planting Moose Lake were about eight inches in length while the Eastern brook trout ran about thirteen inches in length. Moose Lake is locally famous as the largest sheet of water in the Kaweah watershed. It lies an easy day's travel from Giant Forest, at an elevation of some 11,500 feet, and has heretofore, like most other lakes in these mountains, been barren of any fish life.

Proceeding to the upper Kern watershed, the deputies took up adult stock fish from available sources and made thirty-four distinct plants of golden trout in barren waters; principally lakes. Since most of these lakes, and the smaller streams, are as yet unnamed, the waters planted can best be described in general terms, as that section of the Kern River watershed lying west of the Whitney Divide and drained by the North Fork of Volcano Creek, Whitney Creek, Crabtree Creek and the two branches of the East Fork of Kern River.

Deputy Ellis reports that he investigated those waters in the Kern River region which were planted with golden trout by him in 1909 and 1910, and that with two exceptions he invariably found that these plants have been completely successful. These transplanted golden trout have lost none of their original color and markings, and like other varieties of transplanted trout, average larger in size than the original stock.

The transplanted fish seem, in every instance, to have sought out the comparatively quiet waters of open gentle riffles, and are not found in large numbers in extremely rough water or in deep pools below falls and cataracts.

In giving the golden trout this wide distribution, we are but barely anticipating the drain which will be put upon the supply of these incomparable fish by reason of the constantly growing influx of campers and tourists who will annually visit the upper Kern River region. Kern River and the whole Mt. Whitney region, for many years past the summer "outing" grounds for large numbers of people from the San Joaquin Valley, is fast becoming the goal of an army of pleasure seekers from south of Tehachapi. Many automobile parties from southern California reach the region via Kernville and thence by pack train to the various favorable objective points. Many people, too, find their way into the region via Lone Pine and Independence, which are easily accessible by railroad from southern California. From Lone Pine or Independence it is but a short trip with a pack train into the upper Kern River Basin.

On September 1st the deputies left Whitney Meadows with 821 golden trout (*Salmo roosevelti*) with which to stock some selected waters in the Roaring River watershed tributary to the South Fork of Kings River. These stock fish were from three to eight inches in length, and were secured principally by turning a stream, at Whitney Meadows and taking them up in the manner described in previous reports. The expedition had been constantly hampered by terrific storms which prevailed throughout the Sierra Nevada Mountains during all of last summer. Heavy rains spelled muddy, swollen streams and constant difficulty in securing supplies of stock fish. On the return journey the expedition was compelled to travel by a circuitous route because of washed out trails. As an example of the possibilities of packhorse fish distribution in the high mountains, I would state that to reach Roaring River from Whitney Meadows involved descending into the Kern River Canyon, crossing the Kern-Kaweah Divide, thence to Mineral King and on through Timber Gap to the Kaweah Canyon; thence over the Kaweah-Kings Divide and on to Roaring River, a matter of some six days steady travel. Of this lot of 821 golden trout, some fish, when planted, had been in the cans for fourteen days. The total loss from the time of the start from Whitney Meadows until the last fish was planted, amounted to five fish.

On September 4th, Deputy F. A. Bullard relieved Deputy Smalley and thereafter assisted in the distribution of the Roaring River consignment. Thirty-one plants of golden trout were made in barren streams and lakes tributary to Roaring River. A survey of the region enables me to confidently predict that these waters will prove thoroughly adaptable to the golden trout, and that they will become well established throughout the section.

While on the subject of golden trout, I have to report that in July of this year I personally investigated a small plant made by Deputy Bullard in 1911, in the waters of a small creek at Traweeks some six miles east of Dunlap, in Fresno County. This stream lies at an elevation of about 3,500 feet. Its waters, because of the comparatively low elevation, become quite warm during the summer months, reaching a temperature of about seventy-five degrees. On account of the small volume of water and high temperatures, I had never planted trout of any variety therein, believing the stream to be incapable of supporting trout life. Certainly the conditions present a severe test of the adaptability of golden trout to waters in regions other than their native habitat. I found golden trout of various sizes in considerable numbers in this creek. A specimen some twelve inches in length, I judged to be one of the original plant. I found that while the fish were not so brilliantly colored as the fish of Volcano Creek, they were nevertheless very pronouncedly golden trout. I attribute

their somewhat duller coloring to the fact that they are now found in shady pools and in water frequently discolored by decaying leaves and from vegetation. Incidentally I would state that Deputy Ellis reports a peculiar phenomenon in connection with these particular fish. In taking them up for transplanting, a few were accidentally killed. Immediately after their death, and for several minutes, these specimens suddenly glowed with all the brilliancy and peculiarities of color of the original Volcano Creek golden trout. As a further experiment, Deputies Ellis and Bullard, at my direction, took up a number of the golden trout from Traweek Creek and carried them back to a branch of Sugarloaf Creek in the Roaring River watershed and absolutely beyond any possibility of other fish ever becoming mixed with them. The waters selected, while far remote from the Whitney region, are like, by reason of altitude and temperatures, other waters wherein we have successfully established transplanted golden trout. Should these twice transplanted fish regain their original brilliant coloring, it would go far toward confirming the belief of those who hold that golden trout are a distinct species.

After completing their golden trout work, the deputies took up six cans of two year old Eastern brook trout from Jennie Ellis Lake at the head of Boulder Creek, and carried them, a three days' journey, to a large barren lake in Granite Basin, on the divide between Middle and South forks of Kings River.

The time consumed in the various activities of this expedition was sixty days, exclusive of the time required to go and come from the mountains.

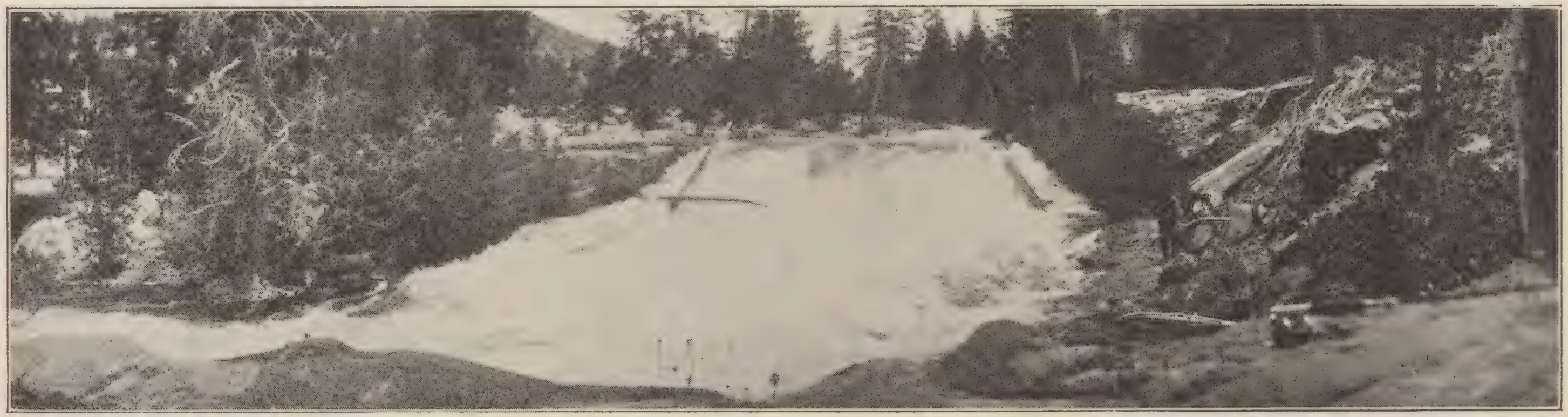
* * *

In addition to the packhorse distribution work, several hundred cans of trout fry from the Sisson hatchery were distributed to public waters throughout this division. Since such plants are a part of the hatchery department records, they will not be specified in this report. Two enterprises, however, are worthy of particular note. In the month of September, 40,000 Loch Leven fry were planted in Lake Huntington. This body of water, some five miles long by one half mile wide, is a new reservoir at the head of the Pacific Light and Power Company's pipe line in eastern Fresno County. Acessible by the San Joaquin and Eastern Railroad, this lake must, in the future, be heavily drawn upon by many people in search of fishing.

At Shaver Lake, also in Fresno County, a departure was made this season from the usual policy of stocking mountain waters with no fish but trout, when we planted therein some 300 adult black bass. The stock fish were secured in the course of our bass rescue operations in Kings County, and were of various sizes, from one half pound to four pounds in weight. Shaver Lake, while fairly well adapted to trout life, will no doubt prove to be most excellent bass waters; and since Big Creek Lake and the nearby streams will be kept strictly trout water, Shaver Lake will eventually offer a pleasing variety in the sport to be enjoyed in that section of the mountains. The popularity of lake fishing for bass is attested by the number of people who annually visit the Crane Valley reservoir on the north side of the San Joaquin River.

The fish planting operations of the Fresno office during the season 1914 will be on a much larger scale than ever before undertaken by this office. It having been demonstrated that more fish could be carried in tin cans than in galvanized ones, tin was substituted for galvanized iron in the construction of pack horse fish cans some three years ago. Experiments in the mean time having demonstrated that canvas containers offer added advantage over tin in the carrying of trout, a new pack horse fish "can" has been evolved by deputies of the Fresno office, which apparently is the acme of perfection in fish carrying receptacles in regions where ice is unavailable and where aeration must be obtained without the aid of artificial methods. The size and shape (oblong) of the usual packhorse can has been retained. The tops and bottoms of the new

Crane Valley reservoir (Madera Co.). Stocked with trout and black bass.



Cascade in Bear Creek (Fresno Co.). Stream stocked with Golden trout in 1914.

containers are of pine five eighths of an inch thick; a throat of tin is inserted in the top, provided with a removable screen as in former cans. A strip of canvas of special design, eighteen inches wide, the ends lapped and sewed in such manner as to make an open envelope, is fitted to the wooden top and bottom and secured thereto by means of clothes-line wire drawn in such manner as to press the canvas tightly into grooves which encircle the boards. To give rigidity to this container, a galvanized iron shield is provided with hangers which, when bolted top and bottom to the "can," makes it to all intents and purposes as rigid as though the whole container were of metal. This shield does not completely encircle the can, covering only the back and ends, and to it are attached straps for hanging the container to the packsaddle. For packhorse work the new device has many advantages. First, just enough water exudes through the canvas to keep down the temperature within the container by evaporation; second, aeration of the water is infinitely better; third, the fish are not liable to injury by striking against canvas; fourth, the cans may be carried "knocked down," and set up at any time without the use of tools; one packhorse can carry a dozen or more of these "knocked down" containers, leaving the rest of the packtrain free to carry barley and other necessary supplies for the expedition. A few extra canvas envelopes, which occupy little space, can be carried for emergency repairs, and in event of an accident to a can on the trail a new canvas form substituted for the injured one. To avoid infection, the canvas envelope may, at any time, be removed and placed in boiling water. The cost of this new type of packhorse can is 50 per cent less than for a well constructed tin can. The details of the new fish carrying device were worked out and 14 pairs of the "cans" were constructed by Deputy D. H. Hoen of the Fresno Division.

Game Conditions in the Fresno Division.

WATERFOWL.

The seasons 1912 and 1913 witnessed a noticeable decrease in the numbers of ducks, geese and shore birds throughout the whole length of the former feeding grounds of these waterfowl. Unquestionably, the inroads of the market hunters are fast depleting the supply of these valuable game birds in a region where, in former years, their numbers seemed to be inexhaustible. Eliminating those sections of the valley where the increase of human population has driven the wildfowl from their former haunts, there remains a natural feeding ground in the Fresno Division, extending from the Stanislaus County line through the trough of the valley to Buena Vista Lake in Kern County, a strip of country from 3 to 10 miles wide and 120 miles long. The numbers of waterfowl which twenty years ago annually visited this region and

remained during the winter months is simply inconceivable and although the supply of ducks and geese has been diminished by fully 80 per cent, this region still continues to be the source of supply of the major portion of the waterfowl which reach the markets of the big cities. Once the supply of any kind of wild game shows signs of decreasing, the annual decrease in numbers seems like an arithmetical progression. The diminution in numbers of waterfowl in the Fresno Division during the past five years has been far greater than in the preceding twenty years.

While the general situation is alarming, a new and hopeful element has been introduced in the cutting down of spring shooting through the federal migratory bird law. With the stoppage of shooting after January 31st, large numbers of ducks, being unmolested during the month of February, remained and nested in the swamp lands of the trough of the valley. Most gratifying reports of nesting ducks come from many points throughout the overflowed section of the valley. The wisdom of stopping the shooting of ducks through the month of February has been demonstrated beyond the possibility of doubt. Nor will the loss of February shooting to the sportsmen be without its compensation, for these homebred birds will afford fall shooting, which in late years has been a negligible factor in the season's sporting possibilities.

QUAIL.

In the Fresno Division as a whole the supply of valley quail has materially decreased during the past two years. The chief untoward factor which has brought about this condition was the two successive dry seasons, 1912 and 1913. It is a well recognized fact that quail do not breed to any considerable extent in dry seasons. There being no perceptible increase in the fall over the number of quail left at the close of the preceding spring, very naturally the coveys of what should be stock birds suffered materially at the hands of the gunners. The hatch of quail in the early summer of 1914 has, however, been most gratifying, and it is possible that by rigid regulations the general supply of quail may be restored in a few years. Speaking particularly of that section from Coalinga southward, and in the hills and valleys of the Coast Range Mountains, which are the western boundary of the San Joaquin Valley, the old-time conditions can never be fully restored. Up to the time of the discovery of oil, these hills were an isolated and seldom visited region. Quail in vast numbers were found in every canyon and valley. In the Cuyama Valley, in Kern County, five years ago the ground was literally covered with them. The development of the oil industry caused many towns of considerable size to spring up in what had formerly been a desert region, and right at the edge of the quail country. The presence of such vast numbers of quail was a direct

invitation to hundreds of gunners and the unsophisticated birds fell easy prey even to tyros. The resulting condition throughout this section is now about on par with that of other parts of the division, and here, as elsewhere, it is apparent that the open season should be shortened and the daily bag limit reduced. There should also be a weekly as well as daily limit of birds which one person may take.

DOVES.

Except in the counties of Tuolumne and Mariposa, the general supply of doves throughout the Fresno Division apparently is well maintained. In spite of the fact that doves are the most generally sought of all the game birds in the Fresno Division, the restriction of dove shooting except during September and October seems to have proven adequate to insure the presence of large numbers of doves for many years. Although the general game law for many years permitted the shooting of doves after July first, several counties of the valley section prohibited, by county ordinances, the shooting of doves until September first. The effect was to add to the general supply a second brood of young doves. The legislature in 1911, in response to a general demand, forbade by law the shooting of doves in the Fourth Fish and Game District until September first. The wisdom of this action is evidenced by the fact that doves may now be found throughout the whole Fourth District in probably as great numbers as at any time during the past ten years. While the ethics of shooting doves under any circumstances may be debatable, the fact remains that throughout the Fourth District dove shooting is the most nearly universal sport of the gunners, and that the supply has been maintained by wise restrictive laws, the number of doves annually killed must be enormous. In the season of 1913, it is estimated that in Fresno County 4,000 gunners were out for doves on the opening day, September first; and it is a tribute to the existing game laws that few if any of these people were disappointed in the day's bag. After the opening date doves could not be so readily secured. Apparently the surviving birds took refuge in the Sierra hills and in isolated sections of the sparsely inhabited west side of the valley. The spring of 1914, however, disclosed the presence of doves in their old breeding grounds in most satisfactory numbers.

MOUNTAIN QUAIL AND GROUSE.

The annual supply of mountain quail and grouse in the mountains of the Fresno Division apparently depends principally upon weather conditions during the nesting season. Except in the counties of Tuolumne and Mariposa, very few mountain quail and grouse, comparatively speaking, are killed by hunters. Except in the counties named, there is

sparse population in the sections where mountain quail are ordinarily found. The range of the grouse is at even higher altitudes. Most people, when in the higher mountains, carry rifles only; hence, their opportunity for killing mountain quail and grouse is a comparatively negligible factor in the situation. Should the opening of the deer season in the Fourth District be made to conform to the season in the Third District, the number of shotguns which would be found in the possession of "outing" parties in the mountains during September would be small indeed, and since weather conditions close the higher mountains to "outing" parties after October, the only mountain quail which would be killed thereafter would be the few which annually migrate down to the hills along the edge of the snowline. Up to this time, the chief source of destruction of mountain quail is undoubtedly bobcats and other natural enemies of the quail.

DEER.

Taken as a whole, the supply of deer in the Fresno Division is about normal. In some sections in both the Sierra Nevadas and the Coast Range Mountains the deer have actually increased, while in other sections there is a noticeable decrease. In Tuolumne and Mariposa counties the situation is satisfactory. In the mountains of Madera County the deer appear to be more than holding their own. In Kern County the situation is satisfactory. There is, however, a decrease in the supply in the mountains of Fresno County, and this condition is very noticeable in some sections of the mountains of Tulare County. The legal season for killing deer in the Fourth District is calculated to benefit neither the deer nor the shooters, and should be changed. The open months for the shooting of deer are now July and August, and while it is an undoubted fact that bucks are not in good condition for human consumption during these months, particularly during July, yet, at this time, they are more easily found and killed. As the law now stands, it is a crime to kill bucks during September and October in the Sierra Nevada Mountains of the Fourth District when, as a matter of fact, they are then in prime condition and infinitely better able to protect themselves from slaughter than during July and August. It may be safely stated that the universal opinion of those who are best informed is that by all means the open season for deer in the Sierra Nevadas should include the months of September and October instead of July and August as at present. There is no good reason why the Sierra Nevada Mountains of the Fourth District should have an earlier deer season than prevails in the mountains of the Third District, since conditions are practically the same throughout the Sierra Nevadas. If there is a difference, from a biological standpoint, it is in favor of a later deer season in the Sierra Nevada Mountains of the Fourth District than that of the third. From

the standpoint of game conservation there is everything in favor of a late open season for deer shooting in the Sierra Nevadas. In September and October they would be successfully killed principally by hunters of some experience, and thus few, if any, immature males and practically no does would be killed through excitement on the part of the hunter. The people who live in the mountains and who now resent the workings of a law which permits the shooting of deer at a time when they are not in prime condition, would be inclined to take personal interest in the protection of deer during the closed season. Aside from all this, it is an economic waste to kill game of any kind when it is not in prime condition.

By an act of the legislature of 1913, that portion of the Coast Range Mountains which was formerly included in the Fourth District, was placed in the Fifth Fish and Game District in order to permit of an earlier open deer season than that which was to be provided for the Fourth District. While there is no question but the deer of the Coast Range hills mature earlier than the deer of the Sierra Nevadas, at the same time July first is too early to shoot deer on the eastern slope of the Coast Range. Considering the comparative accessibility of the Coast Range Mountains, which makes for the easy destruction of deer during the open season, the open season is now too long in those mountains. A single open month, August, would probably be a more rational deer season in the Coast Range. An open season from July fifteenth to September first would be an improvement over present conditions. The development of the oil fields in Fresno and Kern counties, along the edge of the Coast Range hills, has had a decided effect in depleting the deer supply of the Coast Range in those counties. Climatic conditions, however, in the Coast Range, are very favorable to the existence of deer, and with proper conservation a reasonable supply can be maintained for many years.

BEAR, ELK, ANTELOPE, AND MOUNTAIN SHEEP.

Of late years there has been a very noticeable decrease in the number of bear found in the Sierra Nevada Mountains. Once classed as "varmints," whose destruction was the hope of all mountaineers, bear have come to be an object of solicitude on the part of many thoughtful people who live in and near the mountains, and who formerly could see no good in them. As an object of pleasurable pursuit, many people would see the remaining supply conserved; and many people, too, regret the disappearance of any form of wild life. Most of the bear which are now killed are taken during the summer months, principally by means of traps and setguns, at a time when the meat and hide is absolutely worthless. There is a growing sentiment in favor of protecting, by law, the bear of the Fresno Division during the summer months.

Few people know that there are still to be found, in the so-called west side region of Fresno and Kern counties, a few scattering bands of antelope. While their number can never increase to the point where they may be classed as available game animals, yet the few remaining bands are holding their own in numbers, and since their range is in a section where the population must be sparse for a great many years, there need be no immediate alarm over their possible extinction. In time, steps must be taken to impound, in some suitable locality, the remnant of the vast herds of these very interesting animals which once roamed at will the whole San Joaquin Valley, lest one more species of wild life be lost to the world.

In Kern County is to be found the last remnant of the formerly vast numbers of dwarf or tule elk which once inhabited the San Joaquin Valley. These elk are a distinct species, and were never found naturally in the higher mountains. At certain seasons they did inhabit the Coast Range hills, but there is no evidence of elk ever being seen at considerable altitudes in the Sierra Nevadas. It has been recorded in a previous biennial report that the elk of the valley at one time had been reduced to a single pair, which Mr. Henry Miller, of the Miller & Lux corporation, took under his immediate protection on the Button Willow ranch in Kern County, and from this pair the number has increased to about 500 specimens. They now range on the ranches of the Miller & Lux corporation and the Kern County Land Company, all in Kern County. A serious and aggravating problem is now presented as to how to conserve and perpetuate these remaining elk. Roaming at will over the Miller & Lux properties, the elk cause great destruction of grain crops, estimated by Mr. Miller at $5,000 per year. It is a tribute to Mr. Miller that he has borne patiently their depredations these many years, but the time has come when something must be done to impound the elk at public cost. Various schemes for splitting the elk herd into small bunches and removing them to other localities have been advanced, but here arises another complication, best illustrated by an instance where such a plan has already been tried. A number of years ago some twenty-six elk were taken to Sequoia National Park in the mountains of Tulare County. The enterprise was accomplished only after great exertion on the part of those having the matter in charge, and with considerable suffering and mortality among the elk. The federal government fenced a large enclosure within the park, in which to hold the elk, and for a period of years the scheme seemed to work satisfactorily. At the present time, according to the estimate of Mr. Walter Fry, Acting Superintendent of Sequoia National Park, the original twenty-six head which survived transportation have increased to about fifty. Some of

these elk of late years have refused to stay within the enclosure provided for them, and because of the rugged nature of the park, it is apparently impossible to so construct a fence as to prevent their escape. Considerable damage has already been done by wandering elk, to fences and young orchards in the Three Rivers section. It is easily conceivable that if the Kern County herd of elk should be divided and released in small bunches in other sections of the state, much cause for complaint of depredations by escaping elk might arise in those other sections. As suggested by Dr. Grinnell of the University of California, apparently the most satisfactory and feasible solution of the situation would be for the state to secure a section or two of land in the territory which is now the natural range of the elk, and there impound and care for all of the present herd or at least a sufficient number to perpetuate the species. Such a plan would involve considerable expense for the purchasing of land, since it would not suffice to place the elk upon arid lands where feed conditions are uncertain. To provide the best natural condition for the elk would involve the securing of 500 to 1,000 acres of good land out of the Miller ranches along Bull Slough in such location as to permit of enclosing also a large body of government land in the Elk hills which adjoin the tract. Under natural conditions the females of the species sought out the dry arroyos of these hills during the gestation period, and while these lands would not afford sufficient feed to maintain the herds throughout the year, it would be wise to include them in the general scheme of providing a park for the elk. The acreage of good land could be planted to alfalfa, and being already well watered, would provide ample food at all times of the year for the elk. On these lands there would be no difficulty in constructing a fence sufficient to impound the herd.

There still remains a few mountain sheep in the high mountains of the division. A bunch of over twenty was seen last summer near the head of Silver Creek in the summit region of eastern Fresno County. A small band probably still ranges in the inaccessible mountains about the Palisades at the head of the Middle Fork of Kings River. There is no record and no rumors of any unlawful killing of mountain sheep in the division during the past two years.

PRIVATE PRESERVES AND THE GAME LAWS.

By Ernest Schaeffle.

Dissatisfaction over the control and use of wild game is probably as widespread in the United States as it ever was in Europe, where we point whenever we want to show a horrible example of selfishness and injustice to the masses.

And, misunderstanding, as to the real trouble, is apparently as widespread as the dissatisfaction. No two people seem able to agree as to the cause of the universal complaint, the blame being usually placed upon the "game laws." Was ever an institution or programme so generally misunderstood as those compromise statutes, usually ineffective, intended to preserve the country's wild life!

The writer of this article makes no claim to wisdom; but a peculiarly intimate acquaintance of many years with game and fish, "game laws," so-called "poachers" and the general public has given him some knowledge of natural conditions and those unnatural conditions brought about by advancing civilization, and he feels capable of explaining and clearing up some of the existing dissatisfaction and misunderstanding.

We must recognize the fact that in the United States, and in most foreign countries, land is subject to private ownership. Of course in every country large areas are collectively owned, or owned by the "government," the "crown" or by free cities and by states; but, with the possible exception of Russia, the private holding system obtains and is pretty generally regarded as being just and wise. We have the system in this country as an inheritance from our British predecessors in occupancy, who, in turn, had it from the Romans.

Along with the private land ownership system, however, has gone a somewhat conflicting system of public ownership in wild game and fish. That conflict should arise as a result of the dual system was inevitable; but that much of the present day discontent comes from it may not have occurred even to careful students. Let us state the case concretely, and see if it does not immediately become clearer and more convincing.

About ten per cent (more or less) of the population owns the land that is not publicly owned. The remaining ninety per cent owns no land and has no rights to or upon any "land" except public waters and highways, public parks, reservations, etc.

The wild life belongs to the "people," by which we always mean the hundred per cent, whether they own land or not.

Now, the ninety per cent, being people—the same as the ten per cent—like to ramble about on holidays and Sundays and to hunt and fish.

But—and right here the trouble begins—the minority owns the farms and the streams and lake beds and borders, and quite naturally objects to trespassing and keeps or puts the invaders out.

All the while, mind you, the game and fish belongs to the general public, and the general public knows it and curses a system of laws that keeps it away from them and in the practical possession of the landholder.

The fact that a tract of land is used by a "gun club" or "preserve," whether by virtue of ownership or mere lease, is invariably sufficient to irritate the local public. For some reason the prejudice against a farmer who closes his place against public hunting is nothing compared

In the marsh at the head of Newport Bay.

to the ill feeling entertained for a club (or even an individual) who keeps a place as a "preserve." It seems also that, mingled with resentment at being denied a privilege, is to be found a rapidly growing belief that the public has a right to go on private land so long as the purpose is the pursuit and taking of "community property," and so long as no actual damage is done to the landholder's own possessions.

It is, of course, outside the purpose of this article to discuss the questions of land ownership and trespass; but no argument over the ownership of game and the public rights in it can be engaged in without going smash against those questions. And, what is more disquieting, it seems certain that the present trouble between the hunters and fishermen

and those who control the game and fish will continue and increase. What the outcome will be no one can foresee; but it is hard to even imagine that a people wedded to the idea of private ownership in land and in the unrestricted use of it, as well as to the idea of a divine right to protection in such ownership and use, would stand for the general "trespass" that would be needed to bring about the end desired by the public.

That private ownership means careful and often complete protection to wild species is not always accepted by the public as sufficient excuse for the system. Too often sentiment seems to favor utter extinction of what can not be freely and universally enjoyed. This sentiment is, possibly, weak and hysterical, besides being a menace to animals that have the same right to existence and comfort that man himself claims.

The future may prove the viciousness of such feeling by developing some different scheme of holding land, under which every one will have real ownership in such wild life as may be spared by the present ruthless generation. I say present generation advisedly, for it is evident that another twenty-five years will see the practical extermination of every desirable wild species in North America, unless the present slaughter is checked. Some doubting Thomas may say, "That can't be true, for in Great Britain, with her forty-five millions of people, they have been slaughtering for centuries, and still there's plenty of game." Another doubter will say, "Why, just establish public game preserves, like those they have in Oklahoma, and everybody can have game." And even another will say, "All they (note the they) need to do is to start farms everywhere and raise pheasants and wild ducks and deer, etc." Just for fun I am going to show the fallacy of all three arguments—partly because they're all fallacious and dangerous, but largely because they have been given wide circulation by irresponsible and dishonest agencies and are accepted, more or less, by the public.

The first argument is advanced by superficial thinkers. It is true that there is still wild game in Great Britain; but it exists because millions and millions of pounds are spent each year by sportsmen and landholders in fencing and draining, building of roads, trails and telephone lines; in the wholesale poisoning and trapping of predatory birds and animals; in the rearing, liberating and "training" of millions of birds; in the feeding, watering, sheltering and even doctoring of wild deer, grouse and partridges, and in the continuous patrol against "poachers" by a body of "keepers" nearly as large as the regular army of the United States.

Further than this, the kill of game in Great Britain is not to be gauged by either area or population, for out of forty-five millions of people, less than sixty-eight thousand do all the hunting, and the number is decreasing. There are now over one hundred and sixty thousand hunters in California and the number is increasing by leaps and bounds.

As to argument number two—that about public preserves. We have them—have had them for years—and will have more and larger ones. But if the entire state were one preserve it would not raise the game that the public wants. Furthermore, not all varieties would breed in the state; most species of wildfowl breed only in more northern latitudes. What we must realize is that game must be treated like any other crop, saving each year enough seed for the next season's planting, with something over as a safeguard against bad weather, epidemics, etc.

And now we come to the last argument, which, of the three, sounds the best to many enthusiasts. The answer is that the game farms and preserves cost money, even in England, where families have owned the same tract of land until its value has been forgotten or is no longer appreciated, and where labor is dirt cheap. I have been told (by one of them) that capable gamekeepers work in England for $6.00 a month "and found." The same man would demand from $40.00 to $60.00 a month here and would refuse to work as hard or as long. But the great trouble is that successful game preserves and farms are almost an impossibility because of the public's determination to pursue and kill "wild" game, even on private holdings. It is true that every hunter does not "poach" and it is also true that some preserve owners are able to protect their property; but a great many hunters will hunt wherever the shooting is good, and the average farmer or preserve owner gets laughed out of court whenever he attempt the prosecution of a trespasser. Some preserve owners have given up the courts and rely upon the shotgun, which is a favorite plan in Europe. Obviously the plan fails here, and what is worse, carries the whole scheme of things into increasing disrepute.

And now, lest the reader quit with the feeling that the situation is utterly hopeless, I will venture—a prophecy, shall we call it? It is my strong belief, based upon the knowledge gained through experience and investigation, that the American public at last realizes the value of wild life and the terrible necessity of protecting the pitiful remnant left. I believe also, that we will, if we find that the tinkering of the past and of the present has resulted in nothing but a sense of false security, and if compromise measures are not soon found, close down on all killing, whether for commerce or for sport.

DEPARTMENT REPORTS.

REPORT OF LEGAL DEPARTMENT.

By R. D. Duke.

Fish and Game Commission of the State of California:

Gentlemen: I herewith transmit to you a report of the work of the legal department of the commission, for the two years ending June 30, 1914.

Among the more important cases tried by this department for this commission are the following:

In 1909, the board leased about forty-one acres of land near Hayward, in Alameda County, as a game farm, for a period of one year, at $37.50 per month, with option to renew the lease for nine years provided written notice of intention to accept said option were served upon the lessors. During the first year, improvements amounting to about $12,000 had been placed on the land by the Fish and Game Commission; but no written notice as stipulated in the lease was served on the lessors. At the expiration of the term of lease, the lessors began an action for the possession of the property and $2,000 a year rent from and after the expiration of the first year's lease. The court decided that the lessors had waived written notice and instructed them to enter into a lease with the commission for the full term of nine years, upon payment of the original rental stipulated in the lease, which was accordingly done.

For a number of years prior to 1913, there was an organized effort on the part of certain commission merchants in San Francisco to evade the limit law on ducks and to that end transfer companies were formed, which, while endeavoring to act as such, were, in fact, subterfuges of the several commission houses; for the reason that a transfer company is allowed to have in its possession more than the limit of ducks in one day, for the purpose of transportation only. When the commission discovered this fact, all the ducks in the possession of the so-called transfer companies were seized. Thereafter, an action was brought in the superior court to restrain the commission from seizing the ducks, so shipped, and for $5,000 damages. Judgment was rendered in favor of the commission and against the plaintiff, for costs. Since the rendering of this decree, these so-called transfer companies have entirely gone out of business and it has reduced the unlawful distribution of ducks to less than one half.

On March 10, 1913, Special Deputy John W. Galloway placed under arrest Herbert Le Cornec, George Le Cornec and J. W. McNamara, for having in possession steelhead trout, which had been taken with an unlawful net. Galloway turned to speak to McNamara, and while his back was turned to the Le Cornec brothers he was shot through the head by Herbert Le Cornec, and the Le Cornec brothers immediately fled. Deputy Galloway drew his revolver and shot both the Le Cornec brothers. Deputy Galloway and Herbert Le Cornec recovered, but George Le Cornec died as a result of his injury. Herbert Le Cornec was brought to trial for assault to murder and the jury disagreed. After a second trial, verdict "not guilty" was rendered.

On April 26, 1913, Regular Deputy Frank P. Cady and Special Deputy Joseph Nelligan arrested ten Indians for spearing spawning trout on streams running into Tule Lake, Lassen County. Three of the Indians, Wilson Duke, John Hendricks and John Pede, resisted arrest, disarmed Deputy Cady and shot Deputy Nelligan three times and then shot Deputy Cady, severely injuring both. Deputy Nelligan then shot Wilson Duke through the chest. The Indians fled with Wilson Duke and left Cady and Nelligan, believing they were dead. Later, on the same day, Cady and Nelligan were found in a shed near the scene of the shooting. Pede and Hendricks were subsequently placed under arrest and tried on a charge of assault to murder, and the jury found them guilty as charged. Wilson Duke was found guilty of assault with a deadly weapon and pleaded guilty to a second charge of assault with a deadly weapon on Deputy Nelligan, and was sentenced to four years in the state prison at San Quentin, and Pede and Hendricks were each sentenced to three years.

On February 2, 1913, Special Deputy Bert Blanchard was murdered by being shot by two men believed to be Italians, in Contra Costa County. The murderers have never been apprehended.

On the 16th day of April, 1913, near San Quentin Point, Marin County, Deputy M. S. Clark and Special Deputy Ernest Raynaud placed Antone Balesteri and Salvatore Balesteri under arrest for catching striped bass with an unlawful net. Carlo Balesteri requested to be taken into the boat, as an interpreter. After Balesteri had spoken a few words in Italian to the men under arrest, a desperate struggle ensued, during which both Deputy Raynaud and Salvatore Balesteri were killed. Deputy Clark was struck and thrown overboard and an attempt made to run him down, but he was rescued by a Joseph Swack. Antone Balesteri escaped and has never been apprehended. Carlo Balesteri was tried and convicted of murder in the first degree, and sentenced to San Quentin Prison for life.

The conduct of all these deputies, under such trying circumstances, in offering and giving up their lives, in the discharge of their duties, can not be too highly commended.

On March 14, 1914, one A. Parra was arrested for fishing without first obtaining a license therefor. This arrest was made for the purpose of testing the validity of the Market Fisherman's License Act, passed in 1913. A writ of habeas corpus was applied for in the District Court of Appeals of the State of California, in and for the Third District, and a writ was denied. Another writ was later taken to the Supreme Court, which, by also denying the writ, has affirmed the decision of the District Court of Appeals. This determined the constitutionality of the Market Fisherman's License Act.

Besides the above cases, this department, during the period beginning July 1, 1912, to and including June 30, 1914, has tried 225 cases throughout the State of California.

In addition to the above cases, this department has been called upon to give many opinions respecting the laws for the protection of fish and game, to various citizens throughout the State of California, and the several departments of this commission; also many hundred letters answering inquiries for information have been written respecting the fish and game laws.

During the legislature of 1913, this department continually engaged in assisting the legislators in drawing the necessary laws and in making amendments with respect to fish and game legislation.

It has been necessary to visit a great many of the power and irrigating companies of this state with reference to the screening of ditches and the placing of fishways in order to prevent the enormous destruction of fish. This work is far advanced and has been accomplished with but few prosecutions.

San Francisco, June 30, 1914.

REPORT OF SUPERINTENDENT OF HATCHERIES.

By W. H. Shebley.

To the Honorable Board of Fish and Game Commissioners of the State of California.

Gentlemen: I herewith present my report for the year 1913, and so much of the work as has been accomplished and under way for the first six months of 1914. The report of the hatchery department for 1913 shows the number of fish distributed by the commission, from which hatchery or hatching station, the number of fish distributed in each stream and the names of the applicants.

The work of distribution for 1914 is now under way, but will not be completed until late in the fall, therefore it will be impossible to give more than the number of trout at the different stations that are now ready for distribution. The salmon work for 1913 and 1914 is given in full, as the eggs taken during the fall of 1912 were distributed in 1913 and the eggs collected during the fall of 1913 were distributed during the spring of 1914.

This department has been busily engaged in the surveys necessary to screen the ditches and canals throughout the state and to plan efficient fishways or ladders over the dams that obstruct the free passage of fish in our streams. Mr. A. E. Doney, as ladder surveyor, and Mr. A. E. Culver, in charge of the screen investigation and surveys, have rendered valuable services in this work.

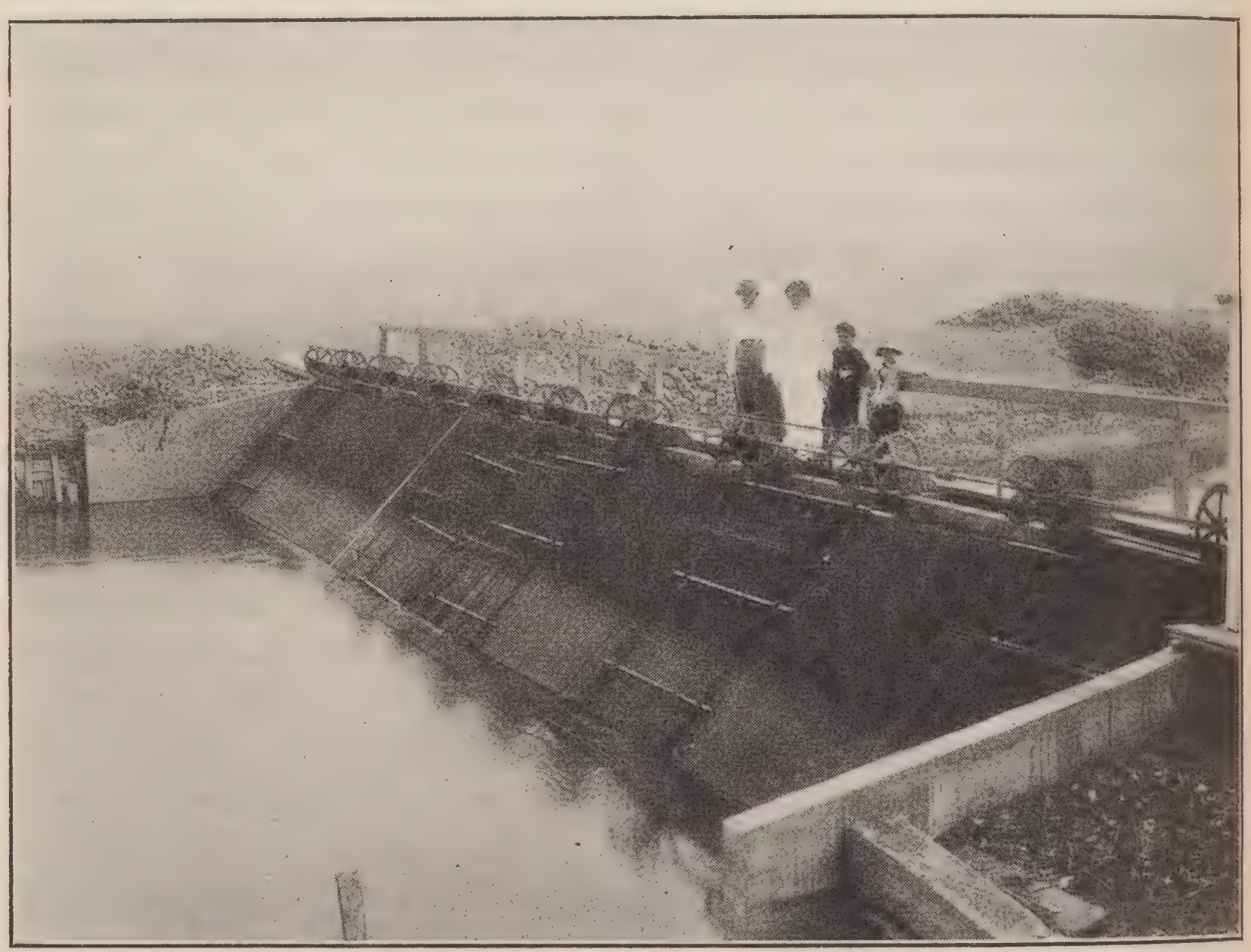
The preliminary studies of the screens most suitable for the conditions that exist in the different parts of the state were begun in 1912. It was found on examination of the conditions that the parallel bar screen with the automatic cleaning device for the large ditches and canals, and the rotary screen devised by R. W. Requa for the smaller ones, are all that is necessary to save the fish, if properly installed and cared for.

Surveys and plans have been made in nearly every county in the state that required screens and ladders for the preservation of the fish. While there is a great deal more to be done, we have, in our limited time, covered as much of the ground as possible. This work necessarily caused a great deal of correspondence. After the plans were made for fish ladders and screens and the legal notices served on the owners of the ditches, canals, and dams to have the work done, in nearly every instance the owners asked for instructions regarding the detail of the work, and in many cases delays were caused by storms, and the inability to get material to complete the work in the specified time. Extensions were granted in all cases where we were satisfied the persons applying for the same were honestly endeavoring to comply with the plans and carry out the instructions given them.

During 1913 and up to date, July 20th, over four hundred and twenty notices were served on the owners of ditches and canals, and plans furnished. Owing to the limited number of men engaged in the investigation, we have not as yet received full reports on the number of screens installed. To date we have a record of two hundred and thirty-five screens that are in place and working satisfactorily. The work of installing the screens was necessarily slow as the surveyor had to make a great many long trips to inspect the ditches, plan the screens particularly adapted for each ditch, as well as to find the owners of the ditches and serve the legal notice on them, to comply with the law.

The large screens in the canals of the Sacramento and San Joaquin valleys were expensive and required considerable skill and judgment in planning them. The parallel bar type with the self-cleaning attachment is the one that we have planned for all of the larger canals. Among the larger screens installed so far are the screens in the canals of the Sacramento Valley West Side Canal Company, near Hamilton City, Glenn County; the East Side Canal Company, Merced County; Pacific Light and Power Company, Kern County; Mt. Whitney Light and Power Company, Tulare County; Peoples Ditch Company, Kings County; Lower Kings River Canal Company, Kings County; Lemoore Canal and Irrigation Company, Kings County; Empire Water Company, Kings County; and the Sutter-Butte Canal Company, Butte County. The screen of the Sacramento Valley West Side Canal Company was our first attempt at a large parallel bar screen. Quite a number of smaller ones of this type had been installed in other parts of the state, but no attempt had been made to construct one of the proportions necessary to efficiently screen a canal of this size. The canal at the place selected for the screen is seventy feet wide and sixteen feet deep. I called on the president of the company, Mr. W. F. Fowler, in February, 1913, and stated that the Commission desired him to screen the canal, as we had demonstrated to our satisfaction that all the ditches and canals in the state could be screened without working a hardship on the owners, if the proper type of screens were used, according to the location and the amount and kind of debris in the water. He willingly agreed to do so if I could suggest a plan that would meet with the approval of the company's engineer, Mr. H. Cauthard. I suggested the parallel bar type with the self-cleaning attachment. Mr. Cauthard immediately took the matter up with an iron manufacturing company and soon had the material for the screen in place. The automatic cleaner is operated with a small motor and the expense of keeping the screen clean is very small. One month last season the expense did not exceed fifty cents for the electric current to run the motor. The motor is operated at such times as is necessary to clean the screen. On page — of this report is a photograph of this screen.

The fishway or "fish ladder" work, as it is commonly called, has been making good progress, when the time for the making of surveys, plans and blue prints are taken into consideration. Delays were caused by owners in asking for extensions of time, necessary to get the materials to construct the fishways, and the time often asked for the surveyor to return and give the builders further instructions regarding the work of construction. During 1913 and 1914 we have made 118 surveys for ladders over dams. Forty-four fishways have been constructed, repaired and are being built. In addition to the fishways constructed, nine obstructions and dams have been blown out by the owners and the commission, to give an unobstructed passage for the fish in different



Screen of Sacramento Valley West Side Canal Co., in Stony Creek, Glenn County. Seventy feet long and sixteen feet deep.

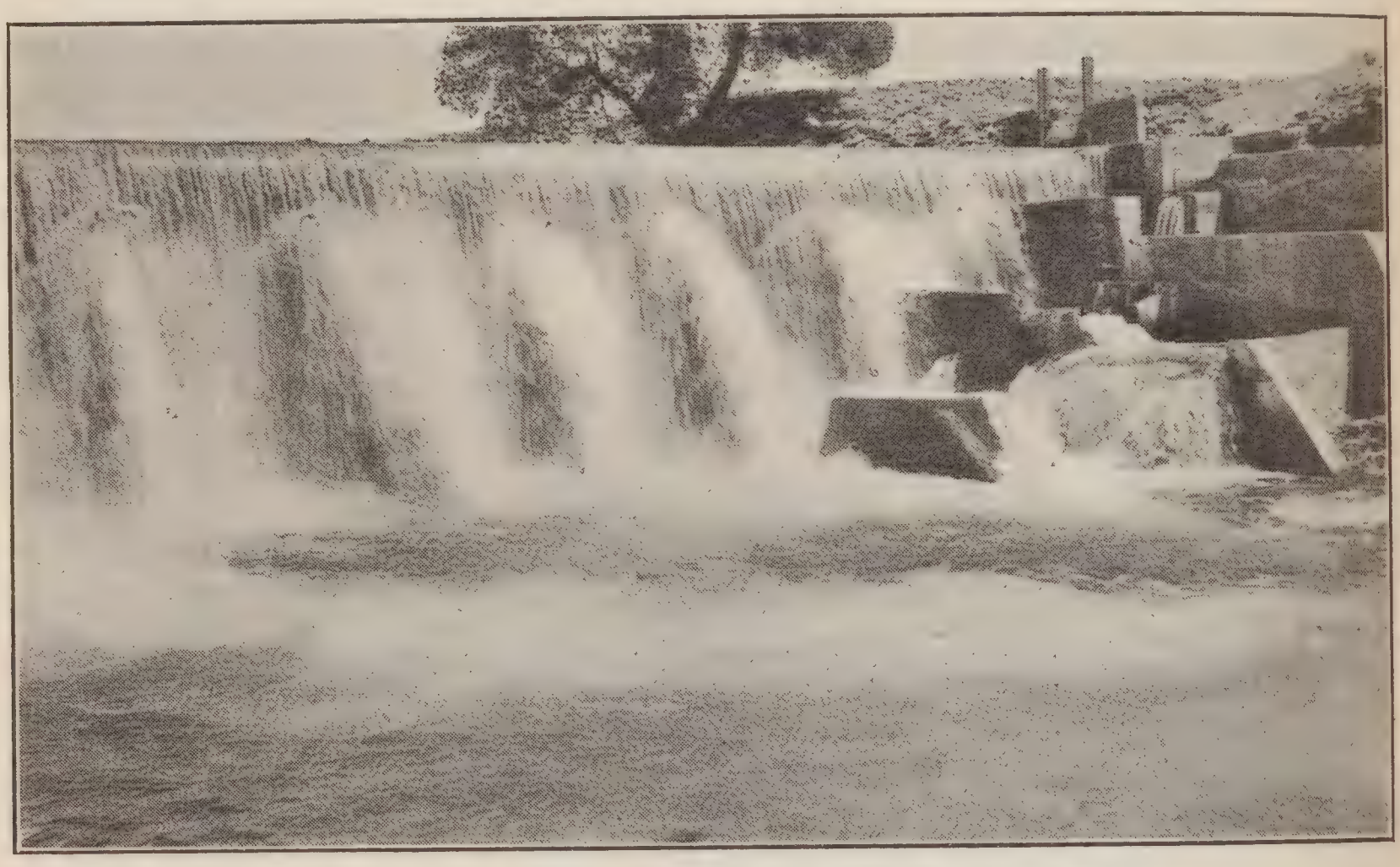
streams. The more important dams have been looked after first. We have made it our constant care to see that all the ladders that have been built and repaired were kept open for the free passage of fish. We have 41 surveys from which blue prints will be made this summer, and it is our earnest endeavor to get as many of these fishways completed by fall as possible.

One important matter relative to fishways should be taken up by the next legislature, and an act passed to compel the owners of fish ladders to allow sufficient water to pass through their fishways at all times to allow the fish a free passage through the ladders as well as to support

the fish life below the dams during the minimum flow of water. It is useless to construct fishways if there is not to be sufficient water in the streams below the dams to keep the fish alive during the minimum flow in the summer and fall. I have studied these conditions for a number of years, and I would recommend that 10 per cent of the amount of water in each stream, river or creek, measured half way between the watershed and the mouth of the stream, be allowed to pass over or through every fishway, dam or obstruction that diverts the water from the main channel, to the mouth of the stream. This act should apply to all streams that do not sink or get so low that they do not flow at their mouths in the dry season. We find considerable difficulty in getting the owners of dams and fishways to allow sufficient water to pass their dams and fishways during the period of low water. If 10 per cent of the water, measured, as stated before, half way between the watershed and the mouth of the stream during the minimum flow, be allowed to flow continuously in the bed of the stream there would be sufficient for the fish, and the loss to the power plants and irrigationists would be very small, as nearly all the persons owning or managing such dams can plan to allow this amount of water to flow over the dams or through the fishways without damaging their interests. Where there are several dams on a stream, each one could give up an amount of water proportionate to the amount used at their respective dams. Thus, for instance, a stream running 3,000 inches of water at the time of the minimum flow had five dams on it; the largest one using or diverting 1,000 inches of water could give up 100 inches, or ten per cent, without material damage, and the others in like proportion according to the amount they had appropriated. This would not be necessary on many streams, for in most places there is sufficient water to support the fish, if it is properly regulated and the fish ladders kept open.

In cooperation with the Nevada Fish Commission a survey was made for an efficient fishway over the Derby dam in the state of Nevada. The Derby dam is the property of the United States Reclamation Service and diverts the water from the Truckee River about thirty miles below Reno, Nevada, for a large irrigation project in that state. We made several trips to this dam to study the conditions existing there. Complaints had reached the California Fish and Game Commission that the large trout from Pyramid Lake could not pass this dam when attempting to ascend the Truckee River into California on their annual migrations to their spawning grounds. We found that the Reclamation Service had installed a fishway, but that it was not properly arranged for the passage of large fish. The small trout in limited numbers would ascend the fishway above the dam, but the large spawners would not pass into it, or through it. With the assistance of Hon. Geo. T.

Mills, President of the Nevada Fish Commission, we gathered the necessary information to establish the fact that the large lake trout from Pyramid Lake could not pass the Derby dam. The matter was taken up with the United States Reclamation Service through Congressman J. E. Raker, who used his influence to further our efforts in having a proper fishway installed. The Reclamation Service desired to make changes on the fishway that had been installed, but in the judgment of the California and Nevada Fish Commissions, it would not meet the requirements. In November, 1913, a survey was made by



Fish-way over Clough Dam in Mill Creek, Tehama County.

our department assisted by the members of the Nevada Fish Commission, for a new fishway over the Derby dam, which in our judgment will allow the large lake trout to pass up the river, if all the details of the plan are properly carried out. As soon as the plans were approved by the Nevada and California Fish Commissions, they were forwarded to Congressman Raker, who presented them to the Secretary of the Interior and the officers of the Reclamation Service, and we have been assured the fishway will be constructed according to the plan that we prepared, this coming fall. Congressman Raker deserves the thanks of the state for his keen interest and untiring efforts in getting the Reclamation Service to construct the fishway over Derby dam.

Following is a list of surveys which have been made for fish ladders to be installed over dams in California up to July 1, 1914:

Owner	County	Stream	Action
Spring Valley Water Co.	Alameda	Arroyo Bayou Creek	Ladder installed.
Spring Valley Water Co.	Alameda	Alameda Creek	Ladder installed.
Harold Meek	Alameda	San Lorenzo Creek	Ladder installed.
Curtz Cons. Mining Co.	Alpine	Carson River	Plans being made.
Nevada-Hercules Mining Co.	Alpine	Carson River	Plans being made.
Sutter-Butte Canal Co.	Butte	Feather River	Ladder installed.
K. Johnson	El Dorado	Trout Creek	Plans being made.
Western States Gas and Electric Co.	El Dorado	South Fork American River	Ladder installed.
K. Johnson	El Dorado	Cold Creek	Plans being made.
Fresno Canal and Irrigation Co.	Fresno	North Fork Kings River	Ladder installed.
U. S. Government	Glenn	Stony Creek	Ladder under construction.
Redwood Mill and Lumber Co.	Humboldt	Little River	Ladder installed.
Elk River Lumber Co.	Humboldt	Elk River	Ladder installed.
Nevada-California Power Co.	Inyo	Bishop Creek	Ladder installed.
Nevada-California Power Co.	Inyo	Bishop Creek	Ladder installed.
Mono Power Co.	Inyo	Owens River	Ladder installed.
Empire Water Co.	Kings	Kings River	Ladder installed.
Empire Water Co.	Kings	Kings River	Ladder installed.
Crescent Canal Co.	Kings	Kings River	Legal notice served.
Riverdale Ditch Co.	Kings	Murphy Slough	Legal notice served.
Riverdale Ditch Co.	Kings	Murphy Slough	Legal notice served.
Lemoore Canal and Irrigation Co.	Kings	Kings River	Legal notice served.
Riverdale Ditch Co.	Kings	Murphy Slough	Legal notice served.
Lassen Townsite Co.	Lassen	Susan River	Ladder installed.
A. Bantley	Lassen	Susan River	Ladder installed.
Robert Elledge	Lassen	Susan River	Ladder installed.
Lassen Townsite Co.	Lassen	Susan River	Plans being made.
Red River Lumber Co.	Lassen	Robbers Creek	Plans being made.
Red River Lumber Co.	Lassen	Feather River	Plans being made.
Honey Lake Land and Livestock Co.	Lassen	Susan River	Plans being made.
Lassen Electric Co.	Lassen	Susan River	Plans being made.
Isaac Hinkle	Placer	North Fork American River	Ladder installed.
Mariposa Commercial Mining Co.	Mariposa	Merced River	Plans being made.
Nameless Mining Co.	Mariposa	Merced River	Plans being made.
Exchequer Mining Co.	Mariposa	Merced River	Plans made, but dam washed out.
San Joaquin Light and Power Co.	Mariposa	Merced River	Plans being made.
Union Mill and Lumber Co.	Mendocino	Pudding Creek	Ladder installed.
Crocker-Huffman Co.	Merced	Merced River	Plans being made.
Alturas Electric Power Co.	Modoc	Pine Creek	Plans being made.
Lakeview Development Co.	Modoc	Lawson Creek	Ladder installed.
Natural falls	Modoc	Lawson Creek	Falls blown out.
Melone Co.	Napa	Dry Creek	Ladder installed.
County of Napa	Napa	Redwood Creek	Legal notice served.
County of Napa	Napa	Redwood Creek	Legal notice served.
Elks Club	Napa	Redwood Creek	Legal notice served.
City Water Co.	Napa	Napa River	Ladder installed.
W. B. Lees	Napa	Redwood Creek	Legal notice served.
State Reformatory	Napa	Rector Creek	Legal notice served.
Pacific Gas and Electric Co.	Nevada	South Fork Yuba River	Ladder installed.
Excelsior Mining Co.	Nevada	Deer Creek	Ladder installed.
Excelsior Mining Co.	Nevada	Deer Creek	Ladder installed.
Pacific Gas and Electric Co.	Nevada	Little Deer Creek	Ladder installed.
Francis Newland	Nevada	Donner Creek	Legal notice served.
Pacific Fruit Express Co.	Nevada	Donner Creek	Ladder under construction.

Owner	County	Stream	Action
Truckee General Electric Co.	Nevada	Truckee River	Ladder installed.
Union Ice Co.	Nevada	Prosser Creek	Ladder installed.
Union Ice Co.	Nevada	Little Truckee River	Ladder installed.
Truckee River General Electric Co.	Nevada	Truckee River	Ladder installed.
Floriston Pulp and Paper Co.	Nevada	Truckee River	Legal notice served.
National Ice Co.	Nevada	Truckee River	Legal notice served.
Great Western Power Co.	Plumas	North Fork Feather River.	Repairs made on ladder.
Grizzly Creek Ice Co.	Plumas	Grizzly Creek.	Ladder installed.
Clairville Lumber Co.	Plumas	Middle Fork Feather River	Dam blown out.
White Pine Lumber Co.	Plumas	Long Valley Creek	Ladder installed.
Fred. Stoukey	Plumas	Long Valley Creek	Plans being made.
Sloat Lumber Co.	Plumas	Long Valley Creek	Plans being made.
Natomas Consolidated Co.	Sacramento	American River	Legal notice served.
Stockton-Mokelumne Co.	San Joaquin	Mokelumne River	Legal notice served.
H. Losse	Santa Clara	Stevens Creek	Plans being made.
J. A. Ferbrache	Santa Clara	Little Arthur Creek	Plans being made.
Watsonville Water Co.	Santa Cruz	Corralitos Creek	Plans being made.
San Jose Water Co.	Santa Clara	Campbell Creek	Legal notice served.
Rowardennan Improvement Co.	Santa Cruz	San Lorenzo River	Legal notice served.
Brown's Valley Co.	Santa Cruz	Brown's Creek	Ladder installed.
Northern California Power Co.	Shasta	North Battle Creek	Legal notice served.
Geo. Raish & Sons	Shasta	Hazel Creek	Legal notice served.
Bennett Smith	Siskiyou	Salmon River	Ladder installed.
Bonally Mining Co.	Siskiyou	Salmon River	Plans being made.
Salmon River Mining Co.	Siskiyou	Salmon River	Plans being made.
Mrs. Mary Reeves	Siskiyou	Indian Creek	Legal notice served.
Mrs. Golden	Siskiyou	North Fork Salmon River	Plans being made.
Spaulding Mill Co.	Siskiyou	Little Shasta Creek	Plans being made.
Edson-Foulke Co.	Siskiyou	Shasta River	Plans being made.
Siskiyou Electric Power and Light Co.	Siskiyou	Shasta River	Ladder installed.
Henry Fiock	Siskiyou	Shasta River	Plans being made.
John Antone	Siskiyou	Shasta River	Plans being made.
Cantara Lumber Co.	Siskiyou	Sacramento River	Legal notice served.
Cloverdale Light and Power Co.	Sonoma	Sulphur Creek	Ladder installed.
Andrew Erickson	Sonoma	Sonoma Creek	Dam washed out.
U. S. Government	Sutter	Yuba River	Plans being made.
Northern California Power Co.	Tehama	South Battle Creek	Legal notice served.
Northern California Power Co.	Tehama	South Battle Creek	Legal notice served.
Northern California Power Co.	Tehama	South Battle Creek	Legal notice served.
Los Molinos Land Co.	Tehama	Mill Creek	Plans being made.
Los Molinos Land Co.	Tehama	Mill Creek	Plans being made.
Vina Ranch	Tehama	Deer Creek	
Clough Brothers	Tehama	Mill Creek	Ladder installed.
Gee & Griffiths	Trinity	Hayfork River	Dam blown out.
Robert Gibson	Trinity	Brown's Creek	Ladder installed.
Bull & Moxon	Trinity	Big Creek	Ladder installed.
Enos & Trimble	Trinity	Hayfork River	Legal notice served.
Valdor Mining Co.	Trinity	Canyon Creek	Legal notice served.
Sheperson Co.	Trinity	Salt Creek	Dam blown out.
Western States Gas and Electric Co.	Trinity	Canyon Creek	Legal notice served.
Enterprise Mining Co.	Trinity	East Fork Trinity River	Legal notice served.
Hayfork falls (natural)	Trinity	Hayfork River	Falls blown out.
Geo. Fenwick	Trinity	East Fork of North Fork, Trinity River.	Legal notice served.
California Safe Deposit Co.	Trinity	East Fork Trinity River	Legal notice served.
F. Anderlini	Trinity	Rush Creek	Dam blown out.
Trinity River Water and Power Co.	Trinity	East Fork Trinity River	Legal notice served.

Owner	County	Stream	Action
Ralph W. Bull	Trinity	Big Creek	Legal notice served.
H. Hampton	Trinity	Reddings Creek	Legal notice served.
Dr. D. B. Fields	Trinity	Indian Creek	Legal notice served.
Trinity Dredging Co.	Trinity	Stewarts Fork, Trinity River.	Legal notice served.
H. Danninbrink	Trinity	Canyon Creek	Dam blown out.
Leach Brothers	Trinity	Hayfork River	Ladder installed.
Pacific Gas and Electric Co.	Yuba	Yuba River	Ladder under construction.
U. S. Reclamation Service	State of Nevada	Truckee River	Ladder under construction.

The pollution of the streams has been given as much attention as our time has allowed. We have had several aggravated nuisances abated and have others pending. The Shasta River, which has been polluted with sawdust for years past, from old sawdust dumps as well as some from recent operations, is now free from pollution. Dams, ditches and restraining walls have been constructed according to plans furnished by this department and there will be no further trouble from that source.

One of the important cases that I desire to call to your attention, is the pollution of the Truckee River by the Crown-Columbia Paper Company. The commission in past years has endeavored to find a way to have the sulphite liquor from the factory deposited where it would not pollute the water of the Truckee River. Several attempts had been made by the company acting under the direction of the commission to have this liquor piped into a settling basin near the plant where it was supposed that it would be absorbed or evaporated, but owing to the loose formation of the rock, it found its way back into the river and caused a serious damage to the eggs deposited by the spawning fish, as was fully demonstrated by the experiments carried out by this department during the fall of 1912, when F. A. Shebley and N. B. Scofield made practical and scientific tests to determine the deleterious action of the sulphite liquor on fish eggs and embryo fish below the paper mill. Last winter the writer and Professor Dinsmore of the University of Nevada were appointed a committee, by your honorable board, to confer with Mr. Louis Bloch, the manager of the paper company, to determine on the best method to prevent the sulphite liquor from polluting the Truckee River. The company had agreed to make any changes that could be suggested along practical lines, either to evaporate the liquor, or to pipe it to some basin where it could be absorbed in the earth and not reach the river. Professor Dinsmore has made a couple of trips to other states where similar plants are located, in an effort to find a practical solution of the problem, and we are at this date awaiting his

return, before taking action. If an evaporator can not be constructed that will be a positive success, I respectfully recommend that a pipe line be constructed that will carry the liquor from the mill to some distant point where it can not do any damage. If this can not be done, I would recommend that the company be restrained by an injunction from further operations until at such time they can find a way of disposing of the sulphite liquor from their mill. I believe that an evaporator can be installed that will evaporate the chemically charged liquor at an expense that will not be prohibitive to the company, and I earnestly hope that this may be accomplished this summer.

SISSON HATCHERY.

Sisson hatchery has been conducted on the same general plan as in the past, as far as the rearing of stock fish and the distribution of trout fry are concerned.

The policy adopted of holding and feeding all of the salmon fry before releasing them, and then only when the flood season is over in the spring, will unquestionably give good results. In my opinion it was the holding and feeding of the salmon fry in the early history of the Sisson hatchery that increased the run of salmon in the Sacramento River, and the present run is largely due to the efforts along those lines in the days when the commission established the Sisson hatchery in an attempt to restore the salmon in the Sacramento River.

Following is a short history of the work at Sisson hatchery during the first years of its operation, which gives my ideas of the results of holding and feeding salmon fry:

The first salmon fry fed in California was after the establishing of the Sisson hatchery in 1888. The United States Commission, in 1883, quit operations at Baird hatchery on the McCloud River. Only 1,000,000 eggs had been taken that season. The salmon had greatly decreased in the Sacramento River, owing to the operations of the mines on the tributary rivers, destroying the spawning beds and the unrestricted fishing on the lower reaches of the river, as well as the wholesale slaughter of the breeding fish by miners, Indians and others during the period that they were entering the tributary streams to spawn.

In 1883, the United States Commission collected approximately 1,000,000 of eggs at the Baird hatchery during the entire season, this being the smallest take in the history of the work on the McCloud River, since the preliminary work of establishing the station in 1872, when the first attempt at the propagation of the Pacific salmon was made by Dr. Livingston Stone. The salmon, though greatly depleted in numbers in the Sacramento River, had ascended as far as Baird in numbers

sufficient to give from 2,000,000 to 14,000,000 eggs each season from 1872 to 1883. This year the salmon in the Sacramento River seemed doomed to extinction. The failing of this year was due largely to the heavy blasting and other operations on the line of the Southern Pacific Railroad, which was then being constructed from Redding northward along the banks of the Sacramento River to the mouth of the Pit River, into which the McCloud River flows. The salmon were undoubtedly frightened so that they did not ascend the Sacramento River, besides a great many were taken and destroyed by the grading gangs and used in the camps for food. Thousands of trout and salmon were destroyed by powder used by the Chinese and white laborers, of whom there were 9,000 camped along the river; and while a great many were used as food, there was wanton destruction in the way they were killed. The same condition existed in 1884, and Superintendent Stone of the Baird hatchery recommended that the station be not operated that season. It remained closed from that date until 1888, the year that the Sisson hatchery was established by the California Fish Commission, in an attempt to restore the salmon run in the Sacramento River.

In 1885 the California Commission decided to establish a hatchery for the propagation of salmon, as the federal government had not again resumed operations at Baird. It was decided to establish a hatchery and an egg collecting station on Hat Creek, a large tributary of the Pit River, where salmon formerly abounded by the thousands during the spawning season. This station was operated for two seasons. The writer was in charge of the work during the last season this station was operated. The work of collecting the eggs was begun early in August and continued until November. Less than 500,000 eggs were collected as the result of the season's work. The spawning beds in Pit River and Hat Creek, that a few years before had been covered with salmon, were now deserted. In the spring of 1888 recommendations were made to the Board of Fish Commissioners and to the Governor of the state to abandon the hatchery or close it down for a number of years, and that a station be established lower down the Pit River or on the main Sacramento River to endeavor to collect the eggs from the few remaining salmon that ascended the Sacramento to the spawning grounds. It was demonstrated beyond any doubt during the two seasons that the Hat Creek hatchery was operated that the spawning salmon that remained did not reach Hat Creek nor the Pit River near its confluence with Hat Creek in numbers sufficient to justify further operations. It was evident to the writer and others who made a study of conditions regarding the spawning salmon, that owing to the greatly diminished number of fish that ascended the Sacramento River, that ample spawning beds were found by the fish lower down and that only a few strag-

glers ascended Pit River and its tributaries. Acting under the recommendation of the writer, the Board of Fish Commissioners ordered the Hat Creek station closed, and began to look for another site.

After a thorough examination and study of the different streams by J. G. Woodbury, the newly appointed Superintendent of Hatcheries, it was decided to locate a salmon hatchery on Spring Creek in Siskiyou County, near the town of Sisson. In the mean time arrangements had been made with the United States Commission to open up the Baird hatchery, collect the eggs at that station and ship them to Sisson, where they could be hatched and the fry reared and fed until they were large enough to liberate in the tributaries of the upper reaches of the Sacramento River. This location and plan of hatching and distributing the salmon fry was concurred in by Mr. Woodbury, representing the California Fish Commission, and Dr. Livingston Stone, Superintendent of Baird hatchery, and the first fish culturist to attempt the propagation of the Pacific salmon. Mr. Woodbury had been Dr. Stone's assistant at Baird during the time of the establishment of the Baird station, and no better authorities on salmon culture could be found, and to this day no marked improvement over their ideas and work has ever been advanced. The writer had personal knowledge of their plans and consulted and worked with both gentlemen.

The Sisson hatchery was completed and ready for operations in September, 1888. The floods did not interfere with the work, and Dr. Stone operated until late in November. Eight hundred thousand eggs were collected from the early fall run and 2,200,000 from the October and November, or late fall run. These eggs were hatched and the fry fed until they were large enough to care for themselves and then carefully distributed in the upper reaches of the Sacramento River and its tributaries. The work of feeding the fry was continued until 1895, when the feeding of the fry was discontinued by the Board of Fish Commissioners, as a matter of economy and a wrong idea that had been advanced by those who were dictating the policy of the fish cultural operations in California, that the salmon fry were better off if distributed as soon as the umbilical sac was absorbed. The benefit of feeding the fry was plainly demonstrated by the great increase of the salmon in the Sacramento River in the years that followed the return of the output of fry from 1888 to 1896. In 1896, 27,000,000 eggs were collected at Battle Creek station, a few miles below the mouth of the McCloud River, and 7,000,000 at Baird station from the McCloud River. During these years a better and more efficient patrol of the bays and rivers was made during the close season than formerly. The laws regarding the legal size of nets used in fishing were enforced, and the Saturday-Sunday non-fishing law was enforced strictly. This

insured a larger number of breeding salmon for the egg collecting stations. These regulations and the feeding of the salmon fry during the period from 1888 to 1896 were, in my opinion, the principal agents in restoring the salmon in the Sacramento River.

After the appointment of the present Board of Fish and Game Commissioners during the summer of 1911, and the reorganization of the department of hatcheries, it was decided to again hold and feed the salmon fry until they were large enough to care for themselves when they were distributed, as well as to hold a large number of them in the ponds at the Sisson hatchery until fall, and then release them in the upper reaches of the Sacramento River during the early fall, before the winter floods. This method of handling the salmon fry will give them a chance to reach the ocean at an age when they can protect themselves from the predaceous spiny rayed fishes that inhabit the lower reaches of the Sacramento River and Suisun, San Pablo and San Francisco bays, through which they must pass before they reach the ocean. During the season of 1913 three quarters of a million salmon fry were held in the ponds at the Sisson hatchery and released during October. This season 21,000,000 salmon fry were held in the troughs, nurseries and ponds and fed until late in the spring. Of this number 2,000,000 were distributed by the California Fish and Game Commission's distributing car in the lower reaches of the Sacramento River near Walnut Grove and Benicia. Four million were placed in the large ponds at the Sisson hatchery in perfect condition, where they are fed daily and looked after by a skilled fish culturist. The remainder were distributed in the tributary streams of the upper Sacramento River. Those placed in the ponds will be released during the early fall, so that they can descend the river slowly and reach the lower reaches of the river and the bays at a time when the spiny rayed fishes are not so active as they are during the summer months. After the temperature of the river falls the bass and other predaceous fishes are not so active in the pursuit of food, and the salmon fry will reach the ocean with less loss than if they are released in the spring or summer.

The Fish and Game Commission of the State of California is now preparing one of the largest and best pond systems for the rearing of salmon fry in the country. Plans are being made to construct enough ponds to hold 10,000,000 of salmon fry next season.

The fry at the Sisson hatchery are first held and fed in the troughs about two months before they are removed to the ponds. Then they are taken out in small lots and fed until all are accustomed to the new surroundings. The pondkeeper distributes the food slowly at the different feeding stations in the ponds, until he is satisfied that all the fry have received their share of food. By this method the fry all make the same

development and growth and there is not any danger of developing a lot of precocious fry to exercise their cannibalistic instincts on the others. During the first cold weather in the fall the fry are ready to be liberated. They are then in readiness for their trip to the ocean at a time when there is not any danger of their being carried into the overflow basins, when many of the predaceous fishes have lost their activity, and when the salmon fry are large enough and conditions of weather and water are such that they will not linger long in the lower reaches of the Sacramento River and bays, but will descend to the ocean with less loss and in better condition than if handled in any other way.

The large island district in the lower Sacramento River, and the bays through which it flows before reaching the ocean, makes the propagation of the salmon a different problem than in any other stream on the Pacific coast. If it were not for the conditions above mentioned, the fry could be hatched and distributed nearer the ocean, but on account of the large bodies of water inhabited by predaceous fishes at the mouth of the Sacramento River it is necessary to hold the fish as long as possible near the upper reaches of the river, and release them at a time when they will make the journey to the ocean in the shortest time possible, if the best results are to be obtained.

During the past year three new ponds have been constructed for the rearing of brood fish, making in all a total of fifty-one ponds and nurseries. With the increasing demand for fish to stock our streams it is necessary to increase our pond system, to enable us to raise stock fish enough to supply the eggs. The loss to our rainbow stock has not been made up as yet. The unwise policy of releasing the stock of rainbow on hand in the beginning of 1911 has caused a shortage in our distribution this season of this variety of fish. The streams in which the wild eggs can be collected can not be depended on. We must depend on our stock fish in the ponds, if we desire a regular supply of eggs each season. This season the tremendous snows of last winter, that kept the tributary streams of the Klamath River high, roily and cold during the spawning season, caused the run of rainbow trout into the tributary streams to be very small, and as our stock of young rainbow trout are not old enough to breed, our take of eggs was limited, as will be shown by the table of distribution. We hope to have sufficient stock fish in our ponds within the next fifteen months, with a few collected from the streams, to meet the demands of the public for fish to stock the waters throughout the state. On the following pages is a list of the streams stocked in 1913.

We have for distribution during the season of 1914, 7,832,000 fry, consisting of the following varieties: Loch Leven, Eastern brook, rainbow, steelhead, black spotted and large lake trout.

The total number of fish on hand in the ponds at Sisson hatchery July 1, 1914, is as follows:

Rainbow trout:		
Adults	2,600	
Two years old	5,000	
One year old	12,000	
Fry	30,000	
		49,600
Loch Leven trout:		
Adults	9,000	
Two years old	1,200	
One year old	13,000	
Fry	25,000	
		48,200
Eastern brook trout:		
Adults	5,500	
Two years old	1,200	
One year old	32,000	
Fry	25,000	
		63,700
Miscellaneous:		
Land-locked salmon, yearling		1,100
Golden-rainbow, adult		45
Grayling, two years old		180
Grayling, one year old		1,400
Total		164,225

TAHOE HATCHERIES.

The Tahoe hatcheries consist of three stations, Tahoe, Tallac, and Glen Alpine. These hatcheries have been under the supervision of E. W. Hunt for the past twenty years, and the results of his management are excellent. The Tahoe and Tallac hatcheries are the property of the state. Glen Alpine is a substation operated in connection with the Tallac hatchery. It is only a small building, the property of the Glen Alpine Hotel Company. It is used by the commission to hatch out a few hundred thousand eggs to save the cost of transportation of the fry. The fry from this station are distributed in the high lakes in the vicinity of Glen Alpine Springs. The principal lakes stocked from this station are Lily Lake, Grass Lake, Susie Lake, Heather Lake, Gilmore Lake, Lucille Lake, Half Moon Lake, Lake of the Woods and Glen Alpine Lake. These small mountain lakes afford excellent fishing for those who desire to make the trip in this region. Glen Alpine hatchery was not operated during the season of 1913 as the run was late and the number of eggs collected did not justify the expense of operating this station.

Tahoe and Tallac hatcheries were operated as usual. The fry hatched out in good condition and were distributed, in the places as shown by the statistical report of the distribution from the Tahoe and Tallac hatcheries for 1913.

This season (1914), Superintendent Hunt was given instructions to get on the ground as early as possible with his crew, as it was the desire of the commission to collect as many of the eggs of the black spotted trout as possible. Mr. Hunt began operations at the mouth of Taylor Creek with his seining crew on April first and collected 5,548,000 eggs. After placing as many eggs as could be safely handled in the Tallac, Tahoe and Glen Alpine stations, the remainder were shipped to Wawona and Sisson hatcheries. The work of the artificial propagation of the black spotted trout at the Tahoe hatcheries has been productive of good results, and the large number of fish taken from the waters of Lake Tahoe and other lakes in that region speak well for the system of work carried on at these hatcheries. The increasing number of fishermen that visit this region each year, owing to the easy trip to the lake by railroad and automobile, causes a demand for a larger output of fry into Lake Tahoe and the lakes of the Tahoe Basin.

I respectfully recommend that the Tahoe hatchery be improved, and enlarged to twice the present capacity. The water supply is limited at the Tahoe hatchery, but I believe that it can be arranged under a different system than the one now in use to double the capacity of this station. If this can not be done, I would suggest that another location be selected for a new hatchery with a capacity of at least 3,000,000 eggs and that arrangements be made for holding the fry until later in the fall before making the distribution. The large lake trout (*Salmo tahoensis*) should be propagated in as large numbers as possible. A well constructed trap should be placed in the Little Truckee River this fall, so that when the run begins next spring no time would be lost and as many eggs collected from this stream as possible. Nearly all the large lake trout spawn in Blackwood Creek and the Little Truckee River. A few enter some of the other creeks, but their numbers are not great enough to justify the expense of trying to collect their eggs. The smaller variety (*Salmo henshawii*) can always be taken in sufficient numbers at the mouth of Taylor Creek to supply all the eggs necessary for stocking the waters of the Tahoe Basin.

BROOKDALE HATCHERY.

Brookdale hatchery was operated during 1913 by the Fish and Game Commission under a lease from Santa Cruz County. Mr. F. A. Shebley has been in charge of this station since it was established in 1905. It is not necessary to mention the efficiency of his management regarding the steelhead work in Santa Cruz County. The increased number of fish in the streams stocked from the Brookdale hatchery since its institution are all the evidence necessary of the valuable work of this station. In the statistical tables will be found the result of the operations of this station for 1913.

This season the commission entered into a contract to purchase the eggs from Santa Cruz County, and gave up the lease. The price agreed on was that the Fish and Game Commission was to pay one dollar and fifty cents per thousand for the eyed steelhead eggs, up to the number of two million, and one dollar per thousand for all eggs that the county of Santa Cruz could furnish up to 3,000,000, provided that the eggs were collected and eyed by a skilled fish culturist and would pass inspection before they were accepted. F. A. Shebley was placed in charge of the work.

The Commission owned property jointly with the county, that was purchased several years ago, to the value of $796.65. This the county of Santa Cruz accepted in part payment of eggs furnished the state.

PRICE CREEK HATCHERY.

Price Creek hatchery has been under the supervision of Mr. W. O. Fassett, who has successfully operated this station for the past fourteen years. We are pleased to note that the salmon are yet plentiful in Eel River, and do not show any signs of a decrease, although the fishing has been as heavy as in past years. This hatchery was established in 1898 at a time when the average number of salmon shipped did not exceed 500,000 pounds. Five years after the artificial propagation of the salmon the number had increased to over 1,500,000 pounds annually. The salmon eggs that restored the run of salmon in Eel River were the surplus eggs shipped from the Sacramento River stations.

In the fall of 1912 we made arrangements to collect the salmon eggs for the Price Creek hatchery by purchasing the mature fish from the fishermen at a nominal cost, but we were not successful. The fishermen did not respond as readily as we expected. They were too anxious to get their fish to the market to assist us by furnishing us the mature fish to supply the eggs so that we could keep up the supply of salmon in the river without a decrease in numbers. During the fall of 1913 we made arrangements to collect the eggs with our own crews. Accordingly Superintendent Fassett was instructed to construct the necessary live cars to hold the fish, and plan to seine the pools for mature fish. A skilled egg collector was sent to assist him in the work. The work started off auspiciously, but just as the run was at its best an unusual storm set in that caused the river to rise and allowed the spawning salmon to leave the pools in the lower reaches of the river, where they congregate before ascending the river to spawn. Before the freshet caused the river to rise a number of mature fish were taken and 472,250 eggs were collected; these, with 3,611,000 eggs shipped from Mill Creek station, were successfully hatched and the fry liberated in Mad River, Elk River, Jacoby Creek, Freshwater Creek and Eel River and Price Creek, as will be shown by the table of salmon fry distribution.

I would recommend that if the funds are available, a well built restraining rack be constructed across Eel River to hold the salmon, and another attempt made this fall to collect the eggs of the salmon from this river. Eel River is one of the most difficult rivers on the coast to construct racks in, as it rises suddenly, and the bed of the river is formed of such a deep deposit of loose gravel and sand that is always shifting whenever there is a rise in the river, which makes it a very expensive piece of work to construct racks that will hold the salmon. The best that can be expected would be a rack that would stand a rise of two or three feet at the most. To attempt to construct a larger rack would be very expensive and one that would require heavy piers sunk deep in the gravel with the bed of the river floored with brush and rock. It would not be practical to construct anything but low racks to withstand a rise of two or three feet. During normal seasons the river would not rise enough to damage the low racks until the salmon run was practically over. If the funds are available, I would recommend the construction of a rack as described above, and preparations made to collect the salmon eggs from Eel River this fall to supply the Price Creek hatchery.

UKIAH HATCHERY.

Ukiah hatchery is located one mile from the town of Ukiah, Mendocino County. It is the property of the city of Ukiah. The state is given permission to use this hatchery through the courtesy of the city of Ukiah. It has been in operation for a number of years under the supervision of Mr. A. V. LaMotte, one of the oldest fish culturists in the state. Mr. LaMotte is particularly successful in the propagation of the steelhead trout.

The Ukiah hatchery was not operated during the season of 1913. Owing to the extremely low water in the streams it was not considered necessary to operate this station, as a sufficient supply of eggs could be collected from Scott Creek to stock all the streams. The streams contiguous to the Eel River and Russian River basins, as well as the streams of Marin County, were stocked with steelhead fry hatched at Sisson hatchery from eggs shipped from Scott Creek station.

As the season of 1914 appeared to be propitious for the collection, propagation and distribution of trout fry, owing to the streams being again filled with an abundance of water after the heavy storms of last winter, it was decided by the commission to operate all the hatching stations to their fullest capacity, if sufficient eggs could be collected. The Board of Fish and Game Commissioners, early in the year, received permission from the Snow Mountain Water and Power Company, to collect eggs at their dam in Eel River and use the old eyeing station for the purpose of preparing the eggs for shipment to Ukiah hatchery.

After the necessary repairs had been made, the crew began work on February 10th and collected 1,713,000 eggs. Eight hundred eighty-one thousand eggs were shipped to Sisson where they were hatched and are now being distributed in the streams throughout the coast counties. The Ukiah hatchery was filled to its normal capacity with eggs (550,000), which hatched in good condition and the fry will be distributed in the streams of Sonoma and Mendocino counties.

The Snow Mountain egg collecting station on Eel River is a very important station and should be owned by the state. It will, if the Eel River is kept well stocked, furnish several million steelhead eggs each season.

I respectfully recommend that the Fish and Game Commission take the necessary steps to establish a permanent egg collecting station at, or near, the Snow Mountain dam, for the purpose of collecting the eggs to stock Eel River as well as the streams tributary to the Russian River and throughout Sonoma and Marin counties.

I would respectfully call the attention of the commission and the legislature to the fact that all of our steelhead stations are held by leases and that the commission is only operating through the courtesy of the owners of the different stations. I would recommend that one or two streams be selected for permanent steelhead trout egg collecting stations, and that the legislature pass an act setting these streams aside as permanent egg collecting streams, and that no fishing be allowed at any time on the streams selected for this work. In my judgment, if these egg collecting reserves be set aside and properly cared for, enough eggs can be collected from the steelhead trout to stock all the coastal streams of California from Little River, Humboldt County, to the Ventura River in Ventura County. If this work is carried out systematically and the coastal streams properly stocked each year, an open season of two months or two months and a half during the winter months could be declared for catching the large steelhead trout when they first leave the ocean to enter the coastal streams. I make this recommendation with this reservation—that the season for taking the large fish be not opened to any but the anglers taking the fish with hook and line, and then only when these egg collecting stations are established and all preparations made for collecting enough eggs to stock the streams in all the coast counties from Humboldt County to the Ventura River.

WAWONA HATCHERY.

The Wawona hatchery was erected by the Washburn brothers in 1895 under an agreement with the commission that it should be operated each season to stock the inaccessible regions above the Yosemite Valley.

The writer had made several trips with fish in that region previous to that time, and successfully stocked a number of lakes and streams

above the Yosemite Valley, but the work was hard and expensive. The hatchery was constructed in the spring of 1895 and the first black spotted trout hatched during June of that year. Since that time the hatchery has been operated each season for a period of about three months, and the excellent fishing in the lakes and streams of that region speak well of the work from this station. Mr. M. L. Cross has been very successful in handling the station. He has had charge of the work at this station for the past ten years, except the season of 1912. He is an experienced and capable man for this work, and when the conditions of the water are considered during the warm summer weather, the excellent condition of the fish distributed from this hatchery speak well of the skill and good judgment used by Mr. Cross in rearing the fry.

The Wawona hatchery was operated during 1913 and also this season, and 220,000 fry were distributed in 1913, a list of which will be found in the table of distribution. This season 242,000 eggs of the black spotted trout were hatched in good order and the fry are now (July 1st) ready for distribution.

The Wawona hatchery is old and dilapidated and should be replaced by a more modern building. A better site should be selected where an abundance of cold water can be had. The supply of water at Wawona station is too warm to hold the fry as long as desired, and I respectfully recommend to your honorable board that a new site be selected near Wawona, on one of the streams tributary to the Merced River where the water is colder, and where the fry can be held longer before they are liberated. The state should get a lease or permit, if a site should be selected in the Yosemite National Park, and erect the hatchery. The Washburn brothers have been fully repaid for their kindness in erecting the hatchery that has done so much good work in the last nineteen years, and the state should now construct a building on their own property, and endeavor to keep this region well stocked by a larger and more up to date hatchery.

THE SACRAMENTO EXPERIMENTAL STATION.

During the fall of 1912 and the winter of 1912-13, the experimental work of attempting to hatch the salmon eggs with the water pumped from wells in the vicinity of the city of Sacramento were continued. The results of the previous winter were not satisfactory. Although a fair percentage of the eggs hatched the embryos were soon affected by the minerals in solution in the water and the lack of well oxygenated water. The water did not have the life sustaining qualities of mountain stream water, although a well arranged system of aeration was used.

During the winter of 1912-13, the well on the Sherburn tract was again pumped. This well appeared to contain less mineral than the other wells in this section that had been tried out. We arranged the troughs in a

barn that had been rented, for the purpose of using it for a hatchery, and conveyed the water in a flume from the well on the Sherburn tract that gave the best results the season before, hoping that a better aeration and longer pumping of the well would improve the condition of the water; but we were disappointed. After heavy pumping of the well for a few days, the eggs were placed in the troughs and the development closely watched. The eggs were carefully tested and examined on arrival and found to be in perfect condition. A few hours after they were in the water they began to change from their natural color to a reddish brown. The embryos soon showed signs of distress by a quick, spasmodic motion in the shell, plainly exhibiting the distress they were in from the action of the mineralized water. A few days later they hatched prematurely, and began dying in great numbers shortly after hatching. The shells by the time the embryos first began hatching were stained to a dark brown color. The troughs, flume, baskets, and other hatching apparatus were all covered with a coating of a reddish brown substance, consisting of iron, barium, etc. The effect of the water from this well was worse on the eggs and embryos this season than in any of the previous experiments. The action of the water was so deleterious that it was only a question of a few days when the embryos would have all been destroyed, so I instructed the employees to deposit the remaining embryo salmon in the Sacramento River and to close the station. The troughs and other apparatus were shipped to Sisson hatchery.

In my opinion there is not any well water in the Sacramento Valley in which the salmon eggs will hatch successfully. I would not recommend any more experiments along these lines as I feel positive that the well water all through the valley contains too much mineral to hatch salmon eggs without destroying, or injuring them so badly that they will not thrive, if they should hatch out. All eggs of the *Salmonidæ* of any species require pure cold spring or mountain stream water in which to hatch. The eggs are very absorbent, and any mineral substance in the water, no matter how small in amount, is gradually absorbed in the economy of the egg, and the embryos will be affected or destroyed from its action.

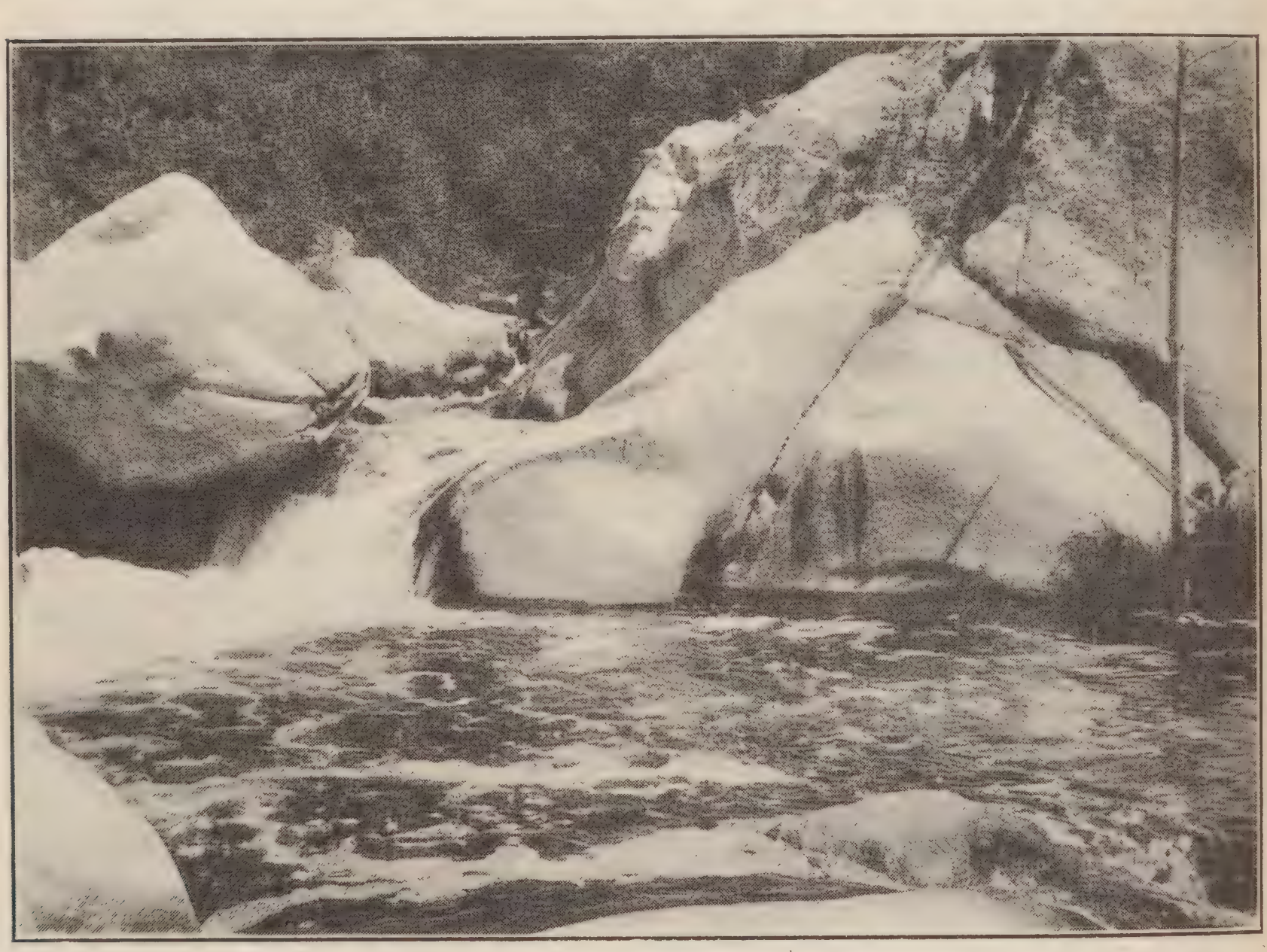
RECOMMENDATIONS.

With the rapidly increasing population of California, a proportionate increase of hatchery work should be carried on, if the streams and lakes of this state are to be kept in condition to meet the demands of the population. All the hatchery stations should be enlarged and improved, and new stations established within the next two or three years.

In my report for 1912 I recommended the erection of a hatchery in southern California, and if suitable conditions are yet to be found, I would recommend the construction of a hatchery of about 1,500,000

capacity. One million five hundred thousand fry properly reared and distributed will keep the streams that are in condition to support trout well stocked. This does not include the streams and lakes in the Seventh District. The streams and lakes of the Seventh District can be supplied from Sisson hatchery. If a suitable site with sufficient water can not be found in the counties lying contiguous to Los Angeles and farther south, I would recommend that a hatchery be established in the Seventh District large enough to supply all the fry necessary for southern California.

Before erecting a large plant in southern California, it is necessary to rear enough stock fish at Sisson or at some other station to furnish the

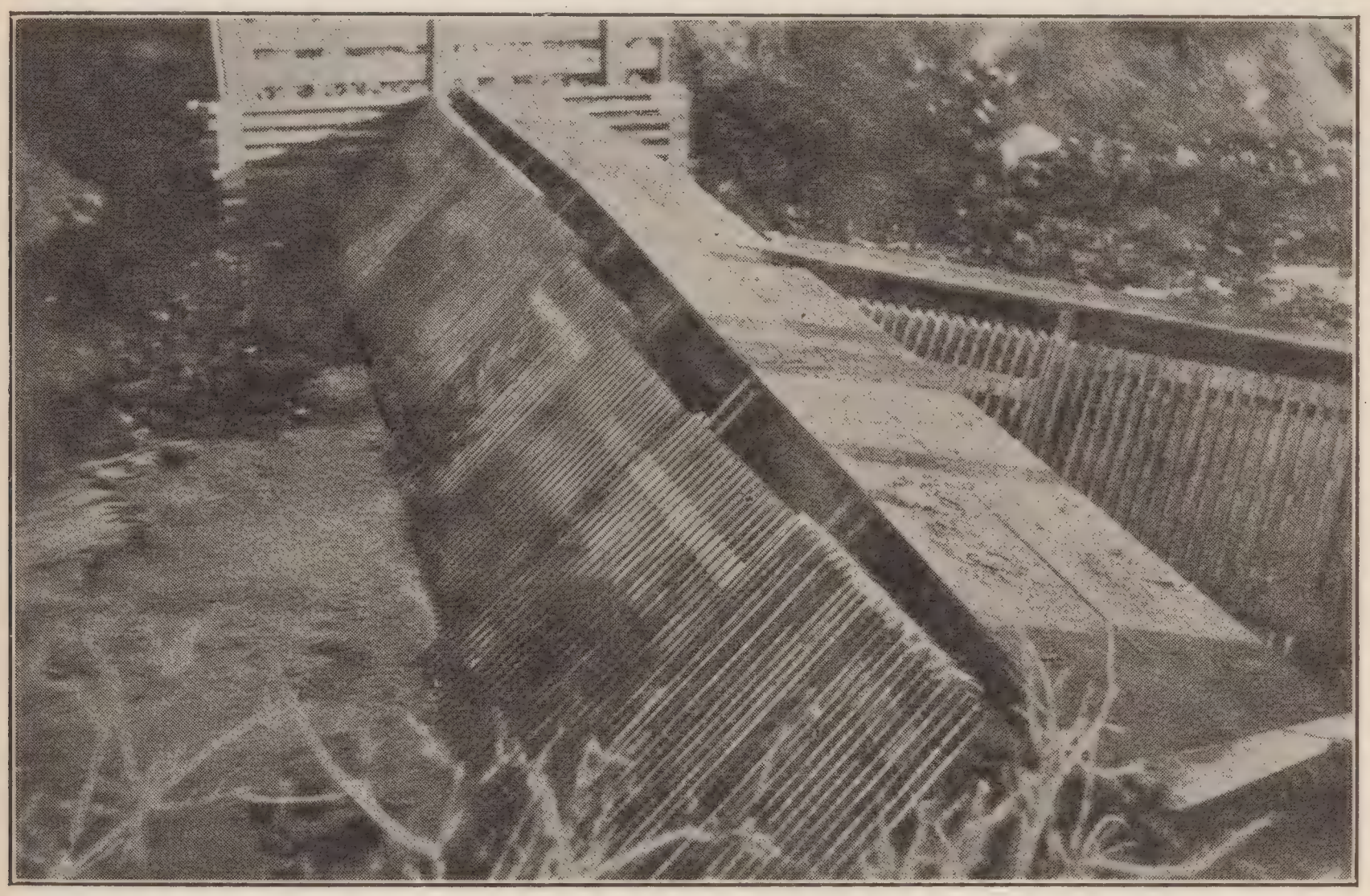


The Mantelpiece—on upper Bear Creek, San Bernardino County.

eggs necessary to supply this region. The steelhead eggs can be collected on our northern coast if arrangements are made to do so. The rainbow eggs can be supplied from our northern stations. The Loch Leven can be supplied from Sisson hatchery. They will thrive in the streams of the higher regions. The black spotted trout will do well in Bear Valley Lake and in some of the higher lakes and reservoirs. The region in which the Eastern brook trout will thrive in southern California is limited, and only a very few will be required to stock all the streams in which they will thrive in southern California.

Owing to the failure of the rainbow trout to enter the tributary streams to the Klamath River in numbers great enough to give us our usual supply of eggs, I would respectfully recommend that egg collect-

ing stations be operated on the tributaries of the Pit River. Mr. E. W. Hunt and myself have just returned from an inspection of the streams that enter Pit River in Shasta County, and believe that the chances are good to collect a large number of eggs in Burney Creek, Clark Creek and Hat Creek. There appears to be as many trout in that region as there were twenty-five years ago when we operated the Hat Creek hatchery. The eggs could be collected and conveyed by team to the old Hat Creek hatchery, where they could he held until they are advanced enough to stand shipping to Sisson or some of the other stations. The Hat Creek hatchery was closed down by the commission in the spring of 1888. The



Fish racks on Camp Creek.

writer was in charge at the time. It was our impression that the state only held a lease on the land on which the hatchery was located. Mr. E. W. Hunt, superintendent of the Tahoe stations, was my assistant at the time.

The board recommended that the station be closed for a number of years as there were not salmon enough at that time in the Pit River to justify the expense of operating the station. Since then no attempt has been made to carry on fish cultural work in that part of the state. Two years age we were informed that the commission owned the land, and that the land that we supposed was held under a lease had been deeded to the state. A short time ago we had the records searched in Redding, Shasta County, and found an instrument on record that purports to deed to the State of California about three and one-half acres of land on the banks of Hat Creek, on which was built the Hat Creek hatchery

and the mess house. The same buildings are there in a good state of preservation today. The only questionable thing regarding the deed is that of the description of the boundary lines. They are not well defined, but when Mr. Hunt and myself visited the station on Hat Creek on July 14th we found the fences and buildings located as they were in 1888. I believe that we can establish the boundary lines as they were then recognized by all the interested parties. One of the signers to the instrument or deed declares that he only signed a lease and claims the land. The other party, who owns another portion of the land, is living, and we will endeavor to get him to assist us in clearing the title to the property. At the time the transactions were made, Mr. Hunt and myself were employed in the hatcheries and did not have any knowledge of the affairs of the commission, as they were then carried on at the head office. The deed on record in Redding was executed April 20, 1885, and in my opinion was drawn up by Judge A. B. Dibble, who was at that time President of the Board of Fish Commissioners. The original copy was probably lost during the fire in San Francisco in April, 1906. When I visited the Hat Creek station I placed Mr. Tucker in charge of the buildings and grounds until we could have the legality of the deed passed on and the boundary lines defined. If we can establish the right of the commission to this property it will make a fine hatching station in a few years, and can be used this winter for the purpose of eyeing the eggs preparatory to shipping them.

If the funds are available, I am of the opinion that better results can be obtained in distributing the fry by one of the messengers from the car accompanying each shipment and supervising the distribution, particularly so where the applicants are not familiar with the handling of the fry. I do not believe in the policy of hatching a large number of fish and having them handled by skilled fish culturists up to the time they are taken from the distribution car, and then turned over to some person who may lose a portion or all of them. A great many applicants have been receiving and distributing fish for years, and they are familiar with all the conditions to properly plant the fry, but we often receive applications from persons who have never handled any fish and they are apt to ignore the instructions on the printed sheet that is given to each applicant.

I again recommend that your honorable board call the attention of the legislature to the danger of allowing any one to introduce any more predaceous or spiny rayed fishes into the waters of this state. I would recommend the passage of an act making it a misdemeanor for any one to introduce any fish or fish eggs into the State of California without first obtaining permission from the Board of Fish and Game Commissioners, so that no one will ever be allowed to introduce any specie of

fish that would be injurious to and probably exterminate our valuable food and game fishes. I would also recommend that every possible means be used to discourage the planting of black bass or any of the spiny rayed fishes in waters where trout will thrive. There is in this state sufficient water for all of these species of fishes without encroaching on the mountain lakes where trout will thrive and where the other varieties will live only to destroy the trout, but not to increase or thrive well enough to take their place.

I urge the recommendation made previously in this report that the 10 per cent water flow regulation be passed. This is a vital subject when the preservation of the trout and salmon are taken into consideration.

Bills were introduced during the last session of the legislature covering nearly all of the above mentioned subjects, but owing to the vicious onslaughts that we received from several demagogues who believed they were making themselves popular by attacking the Fish and Game Commission, our efforts failed and the measures that were introduced for the benefit of the people were left to die in the committees. It is to be hoped that the next legislature will act on these recommendations and pass them, for it is earnestly urged that these measures be passed for the conservation of the fish of the state.

I earnestly recommend the increasing of the hatchery work to meet the demands of the rapidly increasing population of the state. This must be done by increasing the capacities of our hatcheries, and the most important thing of all in my opinion is the increase of the number of ponds for rearing brood fish, and the setting aside of several good coast streams for steelhead trout preserves where enough steelhead trout can be taken each season to supply all the coast streams. If this is done, an open season during the winter months can be had.

This concludes my report. A great many things of importance have been carried on concerning the conservation of the fish through our efforts to install screens in the ditches and canals and fishways over the dams. We have the work well in hand at present, but it will take us at least a year or two longer, with our present crew, to complete this important work. I wish to express my gratitude to the Board of Fish and Game Commissioners for the support they have given me and those associated with me in this work. The earnest and hearty support of my superiors and the untiring efforts of my assistants have made the last two seasons' work among the most successful in the history of the commission.

Respectfully submitted,

W. H. SHEBLEY,
Superintendent of Hatcheries.

Sisson, California, June 30, 1914.

SISSON HATCHERY.

Fish Distribution, Season 1913.

DISTRIBUTION OF QUINNAT SALMON.

Date	Waters stocked	Number
Jan. 27	Cold Creek, tributary to Sacramento River, Siskiyou County	144,000
Jan. 28	Cold Creek, tributary to Sacramento River, Siskiyou County	144,000
Feb. 6	Cold Creek, tributary to Sacramento River, Siskiyou County	15,400
Jan. 29	Cold Creek, tributary to Sacramento River, Siskiyou County	975,000
Jan. 30	Cold Creek, tributary to Sacramento River, Siskiyou County	975,000
Jan. 31	Cold Creek, tributary to Sacramento River, Siskiyou County	975,000
Feb. 5	Cold Creek, tributary to Sacramento River, Siskiyou County	731,250
Feb. 20	Cold Creek, tributary to Sacramento River, Siskiyou County	975,000
Feb. 21	Cold Creek, tributary to Sacramento River, Siskiyou County	780,000
Mar. 18	Cold Creek, tributary to Sacramento River, Siskiyou County	975,000
Mar. 25	Cold Creek, tributary to Sacramento River, Siskiyou County	780,000
Apr. 1	Cold Creek, tributary to Sacramento River, Siskiyou County	650,665
Apr. 4	Cold Creek, tributary to Sacramento River, Siskiyou County	717,120
Apr. 9	Cold Creek, tributary to Sacramento River, Siskiyou County	1,323,856
Apr. 19	Cold Creek, tributary to Sacramento River, Siskiyou County	1,306,500
Apr. 30	Cold Creek, tributary to Sacramento River, Siskiyou County	1,134,900
May 9	Cold Creek, tributary to Sacramento River, Siskiyou County	884,376
May 30*	Held in Sisson Lake, Siskiyou County	550,000
June 17	Cold Creek, tributary to Sacramento River, Siskiyou County	100,000
	Total	14,137,067

*Fry held and fed in Sisson Lake. Released into tributary of Sacramento River, October 11, 1913.

SISSON HATCHERY.

Fish Distribution, Season 1913.

DISTRIBUTION OF LOCH LEVEN TROUT.

Applicant	Date	Waters stocked	Number
Grant P. Merrill	Aug. 31	West Carson River, Alpine County	25,000
F. M. Thatcher	July 30	Kimshew Creek, Butte County	22,500
Ray D. Head	July 30	Butte Creek, Butte County	5,000
R. H. Messinger	Oct. 5	Big Chico Creek, Butte County	10,000
H. M. Perry	July 30	Little Butte Creek, Butte County	10,000
John P. Fisher	Aug. 27	South Fork American River, El Dorado County	5,000
Lawrence & Comstock	Aug. 31	Cascade Lake, El Dorado County	7,500
C. A. Swisler	Sept. 14	Upper and Lower Echo lakes, El Dorado County	10,000
San Joaquin and Eastern Railway	Sept. 10	Big Creek Lake, Fresno County	40,000
E. B. Waterman	Sept. 10	Mill Creek, Fresno County	15,000
F. D. Hall	Aug. 14	Susan River, Lassen County	5,000
F. P. Cady	Aug. 14	Willow Creek, Lassen County	15,000
Wm. G. Kerckhoff	Sept. 24	San Antonio Creek, Los Angeles County	20,000
H. W. O'Melveney	Sept. 30	Bear Canyon and Cold Water Creek, Los Angeles County	37,500
Geo. E. Little	Sept. 30	Rio Hondo and San Jose creeks, Los Angeles County	5,000
E. D. Silent	Sept. 30	Truinfo Creek, Los Angeles County	2,500
California Anglers' Association	Aug. 9	Lake Lagunitas, Marin County	20,000
Yosemite Valley Railway	Sept. 18	Merced River and Moss Canyon, Mariposa County	25,000
Huffman & Washburn	Sept. 10	Merced River, Mariposa County	15,000
T. F. Dunnaway	Aug. 14	Goose Lake, Modoc County	10,000
Chas. E. Lethead	Aug. 14	Goose Lake, Modoc County	5,000
C. W. Williams	Aug. 14	South Fork, Pit River, Modoc County	5,000
A. Mosher	Aug. 14	South Fork, Pit River, Modoc County	7,500
Will W. Ahl	Aug. 14	Fitzhugh Creek, Modoc County	5,000
Jess Parman	Aug. 14	Eagle, Emerson and Rader creeks, Modoc County	5,000
J. Todd Bonner	Aug. 14	Canyon Creek, Modoc County	2,500
John L. D. Roberts	Sept. 6	Garrapitas Creek, Monterey County	25,000
F. M. Rutherford	July 7	Donner Lake, Nevada County	17,500
Nevada City Hunting and Fishing Club	Aug. 19	Deer Creek, Nevada County	10,000
W. Thompson	Aug. 19	Weaver and Bowman lakes, Nevada County	10,000
Grass Valley Sportsmen's Club	Aug. 31	Steep Hollow, Perriss and Barkers creeks, Nevada County	12,500
W. C. Murdoch	Sept. 18	Tributaries of Webber Lake, Nevada County	5,000
W. M. Avis	Sept. 24	Santa Ana River and tributaries, Orange County	5,000
Joseph Gowling	July 7	North Fork American River, Placer County	10,000
Katherine Chandler	July 8	Bear River, Placer County	7,500
Lake Tahoe Railway and Transportation Co.	Aug. 20	Watson Lake, Placer County	20,000
J. B. Knapp	Aug. 31	North Fork American River, Placer County	7,500
Geo. P. Kelley	Aug. 31	North Ravine, Placer County	5,000
H. M. Freeman	Aug. 31	Loch Leven Lakes, Placer County	20,000
Fred P. Tuttle	Aug. 31	Lake Stirling, Placer County	6,000
Frank L. Harmon	Sept. 18	Little Bear River, Placer County	5,000
Pacific Gas and Electric Co.	Oct. 7	Fordyce Lake, Placer County	12,500
G. N. Johnson	July 26	Smith Creek and Feather River, Plumas County	12,500
Chas. Jones	July 26	Grey Eagle Creek, Plumas County	12,500
W. D. Bernheim	July 26	Wade and Rock lakes, Plumas County	15,000
Geo. A. Hall	Sept. 28	Indian Creek, Plumas County	25,000
Quincy Chamber of Commerce	Sept. 14	Hungarian Lake and Spanish and Greenhorn creeks, Plumas County	25,000
H. G. Porter	Oct. 7	East Branch, North Fork Feather River, Plumas County	25,000
Strong & Dickinson	Sept. 30	Strawberry Creek, Riverside County	5,000
Jas. A. Vale	Sept. 24	Devil Canyon, and Santa Ana, Bear and Mill creeks, San Bernardino County	42,500
C. L. Watson	July 30	Clear Creek, Shasta County	10,000

SISSON HATCHERY—Continued.

Fish Distribution, Season 1913.

DISTRIBUTION OF LOCH LEVEN TROUT—Continued.

Applicant	Date	Waters stocked	Number
Kennett Athletic Club	Sept. 14	Big Backbone Creek, Shasta County	6,000
Mrs. Geo. W. Kenney	July 7	Lake Independence, Sierra County	7,500
F. J. Hunger	July 26	Upper and Lower Sulma lakes, Sierra County	10,000
A. S. Nichols	Sept. 14	Cool Creek, Sierra County	10,000
A. P. Wright	July 22	Mt. Eddy Lakes, Siskiyou County	6,000
Zick Abrams	Aug. 14	Abrams Lake No. 1, Siskiyou County	18,000
O. E. Pile	Aug. 23	Butte Creek, Siskiyou County	5,000
McCloud River Railroad Co.	Aug. 30	McCloud River, Siskiyou County	12,500
Wm. J. Bray	Sept. 1	Antelope Creek, Siskiyou County	7,500
R. S. Taylor	Sept. 2	Taylor Creek, Siskiyou County	5,000
Ed. F. Jared	Sept. 2	Shasta River, Siskiyou County	7,500
Zick Abrams	Sept. 5	Abrams Lake No. 2, Siskiyou County	9,000
W. E. Tebbe	Sept. 19	Salmon River, Siskiyou County	2,500
Robert Rupp	Sept. 26	Sullaway Creek, Siskiyou County	10,000
J. H. Hoerl	Sept. 28	Sullaway Creek, Siskiyou County	10,000
Chas. Wright	Oct. 1	Cold Creek, Siskiyou County	40,000
W. E. Tebbe	Oct. 9	South and Main branches Etna Creek, Siskiyou County	5,000
Porterville Fish and Game Protective Association	Sept. 10	South Tule River and North Branch of South Tule River, Tulare County	25,000
Tule River Shooting and Fishing Club	Sept. 10	McIntyre, Boulder and Bear creeks, Tulare County	15,000
Widgeon Gun Club	Sept. 10	Kaweah River and Monarch Lake, Tulare County	22,500
Deer Creek Fish and Game Protective Association	Sept. 10	North and South Deer creeks, Tulare County	10,000
Berry and Cramer	Sept. 10	Spears Creek, Tulare County	5,000
Major Wm. T. Littlebrandt	Sept. 18	Evelyn and Fletcher lakes and 2 unnamed lakes, and Bogelsang Lake, Tuolumne County	25,000
J. B. Curtin	Sept. 14	South Fork Tuolumne River, Tuolumne County	5,000
G. F. Conlin	Sept. 14	Herring Creek, Tuolumne County	25,000
L. H. Elliott	Sept. 14	Main Fork Stanislaus River, Tuolumne County	20,000
Jas. A. Rasmussen	Sept. 24	Ventura River, Ventura County	20,000
E. D. Silent	Sept. 30	Truinfo Creek, Ventura County	2,500
Filmore Chamber of Commerce	Sept. 30	Sespee Creek, Ventura County	10,000
		Held in ponds at Sisson Hatchery	90,000
			1,132,500

SISSON HATCHERY—Continued.

Fish Distribution, Season 1913.

DISTRIBUTION OF EASTERN BROOK TROUT.

Applicant	Date	Waters stocked	Number
W. H. King	July 26	Flea Valley and Dogwood creeks, Butte County	10,000
F. M. Thatcher	July 30	Kimshew Creek, Butte County	17,500
W. M. Pence	July 30	Honey Run and Dry Creek, Butte County	12,500
Ray D. Head	July 30	Butte Creek, Butte County	10,000
Murphy Bros. & Morgan	Aug. 20	Hank Richardson and Miller lakes, El Dorado County	10,000
Glen Alpine Springs Company	Aug. 20	Lake Lucille, El Dorado County	10,000
W. W. Price	Aug. 20	Glen Alpine Creek, El Dorado County	7,500
Lawrence & Comstock	Aug. 20	Mountain Top and Velma lakes, El Dorado County	10,000
John P. Fisher	Aug. 27	South Fork American River, El Dorado County	10,000
Lawrence & Comstock	Aug. 31	Little Truckee River and Abe Jewell Creek, El Dorado County	15,000
Mrs. Geo. Farley	Aug. 27	Kelsey Creek, Lake County	10,000
Will R. Horn	Aug. 14	Smoke Creek, Lassen County	5,000
F. D. Hall	Aug. 14	Willow Creek, Lassen County	2,500
Geo. H. Knight	Aug. 14	Upper Ash Creek, Lassen County	5,000
Wm. G. Kerckhoff	Sept. 24	San Antonio Creek, Los Angeles County	20,000
W. J. Sanborn	Sept. 24	Headwaters San Antonio Creek, Los Angeles County	10,000
H. W. O'Melveney	Sept. 30	Devils Canyon, Los Angeles County	10,000
Lagunitas Rod and Gun Club	Aug. 9	Lily Lake, Marin County	5,000
California Anglers' Association	Aug. 9	Lake Lagunitas, Marin County	5,000
Major Wm. T. Littlebrandt	Sept. 18	Echo and East and West Forsyth Pass lakes, Marisopa County	12,500
Yosemite Valley Railway	Sept. 18	Merced River, Mariposa County	17,500
Chas. E. Lethead	Aug. 14	Goose Lake, Modoc County	5,000
Dr. C. M. Tinsman	Aug. 14	Lower Ash Creek, Modoc County	7,500
Walter W. Cochran	Aug. 14	Mill Creek, Modoc County	2,500
Omar Cantrall	Aug. 14	Mill Creek, Modoc County	2,500
L. H. Sisson	Aug. 14	East Creek, Modoc County	2,500
C. W. Williams	Aug. 14	South Fork Pit River, Modoc County	5,000
Jess Parman	Aug. 14	Eagle, Emerson and Rader creeks, Modoc County	5,000
J. H. Bowers	Aug. 14	Joseph Creek, Modoc County	2,500
E. E. Archer	Aug. 14	Shields Creek, Modoc County	5,000
F. M. Rutherford	July 7	Donner and Schafer creeks, Nevada County	20,000
Boca Mill Co.	July 8	Juniper Creek, Nevada County	10,000
W. A. Buckman	July 7	Cold Stream, Nevada County	10,000
Grass Valley Sportsmen's Club	Aug. 31	Squirrel, Woodpecker and Slate creeks, Nevada County	25,000
Sierra Nevada Wood and Lumber Co.	Aug. 31	Prosser Creek, Nevada County	20,000
S. McKay	Sept. 18	Juniper Creek, Nevada County	15,000
H. M. Freeman	July 7	South Yuba River, Placer County	15,000
Joseph Gowling	July 7	North Fork American River, Placer County	15,000
Katherine Chandler	July 8	Five Lakes, Placer County	7,500
C. F. Kohl	Aug. 20	Blackwood Creek, Placer County	5,000
Lake Tahoe Railway and Transportation Co.	Aug. 20	Watson Lake and Ward and Bear Pen creeks, Placer County	20,000
North Fork Association	Aug. 20	Cedar, Onion and Castle creeks, Placer County	10,000
J. C. Scott	Aug. 20	Squaw Creek, Placer County	10,000
J B. Knapp	Aug. 31	North Fork American River, Placer County	7,500
Geo. P. Kelley	Aug. 31	North Ravine, Placer County	5,000
Dr. Wm. M. Tryon	Aug. 31	Canyon Creek, Placer County	9,000

SISSON HATCHERY—Continued.

Fish Distribution, Season 1913.

DISTRIBUTION OF EASTERN BROOK TROUT—Continued.

Applicant	Date	Waters stocked	Number
Frank L. Harmon	Sept. 18	Little Bear River, Placer County	5,000
W. J. McCleary	Oct. 7	Butcher Canyon and American River, Placer County	7,500
D. N. Rogers	July 26	Buck and Mill creeks and Three Lakes, Plumas County	10,000
W. D. Bernheim	July 26	Eureka Lake, Plumas County	10,000
Quincy Chamber of Commerce	Sept. 14	East Branch and Greenhorn Creek, Plumas County	20,000
Strong & Dickinson	Sept. 30	Strawberry and North Fork of San Jacinto creeks, Riverside County	17,500
W. M. Pearce	Sept. 30	Cucamonga Creek, San Bernardino County	5,000
C. L. Watson	July 30	Five Mile Gulch, Shasta County	5,000
Kennett Athletic Club	Sept. 14	Big Backbone Creek, Shasta County	4,500
Mrs. Geo. W. Kenney	July 7	Lake Independence, Sierra County	7,500
F. J. Hunger	July 26	Church Creek, Sierra County	5,000
R. W. Thorne	Aug. 14	Turner, Smith and Badnock creeks, Sierra County	10,000
A. S. Nichols	Sept. 14	Blinman Creek, Sierra County	7,500
D. M. Swobe	Aug. 25	McCloud River, Siskiyou County	30,000
McCloud River Railway	Aug. 30	McCloud River, Siskiyou County	25,000
Wm. J. Bray	Sept. 1	Antelope Creek, Siskiyou County	6,000
R. W. Taylor	Sept. 2	Taylor Creek, Siskiyou County	5,000
Zick Abrams	Sept. 5	Abrams Lake No 2, Siskiyou County	9,000
Robert Rupp	Sept. 26	Sullaway Creek, Siskiyou County	10,000
Chas. Wright	Oct. 1	Cold Creek, Siskiyou County	30,000
California Anglers' Association	Aug. 9	Pole Mountain Creek, Sonoma County	2,500
Geo. Neale	Aug. 8	Battle Creek, Tehama County	12,000
Deer Creek Fish and Game Protective Association	Sept. 10	North and South Deer creeks, Tulare County	10,000
Berry & Cramer	Sept. 10	Peal Creek, Tulare County	5,000
J. B. Curtin	Sept. 14	South Fork Tuolumne River, Tuolumne County	5,000
G. F. Conlin	Sept. 14	South Fork Tuolumne River, Tuolumne County	10,000
L. H. Elliott	Sept. 14	Main Fork Stanislaus River, Tuolumne County	10,000
		Held in ponds at Sisson Hatchery	80,000
		Total	820,500

SISSON HATCHERY—Continued.

Fish Distribution, Season 1913.

DISTRIBUTION OF RAINBOW TROUT.

Applicant	Date	Waters stocked	Number
W. H. King	July 26	Flea Valley, Dogwood, Camp and Mill Creeks, Butte County	21,000
B. F. Kauffman	July 30	Feather River, Butte County	12,000
W. J. Whittier	July 30	West Branch of North Fork Feather River, Butte County	12,000
Clay Buchanan	July 30	West Branch of North Fork Feather River, Butte County	12,000
Dr. P. H. Dunbar	July 30	West Branch of Feather River and Kimshew Creek, Butte County	12,000
F. M. Thatcher	July 30	West Branch of Feather River, Butte County	24,000
A. C. Musselman	July 30	Little Butte Creek, Butte County	12,000
H. N. Perry	July 30	Big, Little and Middle Butte creeks, Butte County	18,000
A. J. Stanley	July 30	West Branch of Feather River, Butte County	18,000
J. C. Carter	July 30	Big Creek, Butte County	36,000
Ray D. Head	July 30	Butte Creek, Butte County	24,000
D. E. Roberts	Aug. 27	Esperanza Creek and South and North forks Mokelumne River, Calaveras County	27,000
D. E. Roberts	Sept. 14	San Antone and Mill creeks, Calaveras County	15,000
John P. Fisher	Aug. 27	South Fork American River, El Dorado County	38,000
Mrs. Geo. Farley	Aug. 27	Alder, Nutmeg and Jones creeks, Lake County	12,000
F. D. Hall	Aug. 14	Willow Creek, Lassen County	6,000
F. P. Cady	Aug. 14	Susan River, Lassen County	12,000
Geo. H. Knight	Aug. 14	Upper Ash Creek, Lassen County	6,000
Wm. G. Kerckhoff	Sept. 24	San Antonio Creek, Los Angeles County	10,000
W. J. Sanborn	Sept. 24	Headwaters San Antonio Creek, Los Angeles County	10,000
H. W. O'Melveney	Sept. 30	Main, West and North forks San Gabriel and Cattle Canyon, Los Angeles County	107,500
Geo. E. Little	Sept. 30	Rio Hondo and San Jose, Los Angeles County	10,000
E. D. Silent	Sept. 30	Truinfo Creek, Los Angeles County	5,000
Major Wm. T. Littlebrandt	Sept. 18	Echo and Cathedral lakes and Merced River, Mariposa County	12,500
Yosemite Valley Railway Co.	Sept. 18	Merced River, Mariposa County	20,000
Huffman & Washburn	Sept. 10	Miami Creek, Mariposa County	10,000
Walter W. Cochran	Aug. 14	Mill Creek, Modoc County	6,000
Omar Cantrall	Aug. 14	Mill Creek, Modoc County	6,000
L. H. Sisson	Aug. 14	East Creek, Modoc County	6,000
C. W. Williams	Aug. 14	South Fork Pit River, Modoc County	6,000
Will W. Ahl	Aug. 14	Fitzhugh Creek, Modoc County	12,000
J. H. Bowers	Aug. 14	Joseph Creek, Modoc County	6,000
J. Todd Bonner	Aug. 14	Canyon Creek, Modoc County	6,000
E. E. Archer	Aug. 14	Shields Creek, Modoc County	6,000
J. L. D. Roberts	Sept. 6	Mill and Rocky creeks, Monterey County	12,500
W. B. Tubbs	Aug. 27	Lilly, Mill, Troutdale and Bear creeks, Napa County	18,000
Wm. West	Aug. 27	Milliken Creek, Napa County	75,000
W. L. West	July 7	Yuba River, Nevada County	27,000
F. M. Rutherford	July 7	Donner and Prosser creeks, Nevada County	30,000
Boca Mill Co.	July 8	Little Truckee River, Nevada County	24,000
Nevada City Hunting and Fishing Club	Aug. 19	Rush, Rock and Deer creeks, Nevada County	60,000
W. Thompson	Aug. 19	Poorman and Boroman creeks and Middle Yuba River, Nevada County	12,000
Grass Valley Sportsmen's Club	Aug. 31	Yuba River, Greenhorn, Deer and Rattlesnake creeks, Nevada County	50,000
Sierra Nevada Wood and Lumber Co.	Aug. 31	Prosser Creek, Nevada County	10,000
W. C. Murdoch	Sept. 18	Tributaries of Webber Lake, Nevada County	15,000
San Francisco Fly Casting Club	Oct. 7	Truckee River, Nevada County	15,000
W. M. Avis	Sept. 24	Santa Ana River and tributaries, Orange County	10,000

SISSON HATCHERY—Continued.

Fish Distribution, Season 1913.

DISTRIBUTION OF RAINBOW TROUT—Continued.

Applicant	Date	Waters stocked	Number
H. M. Freeman	July 7	South Yuba River, Placer County	24,000
Joseph Gowling	July 7	North Fork American River, Placer County	18,000
Katherine Chandler	July 8	Bear River, Placer County	9,000
Murphy Bros. and Morgan	Aug. 20	Buck Lake, Placer County	9,000
Lake Tahoe Railway and Transportation Co.	Aug. 20	Truckee River, Placer County	24,000
North Fork Association	Aug. 20	North Fork American and South Fork Yuba rivers and Lake Flora, Placer County	21,000
Wm. N. West	Aug. 20	Green Valley Ravine and North Fork American River, Placer County	16,000
Dr. Wm. M. Tryon	Aug. 31	Canyon Creek, Placer County	9,000
G. H. Goodhue	July 26	Indian Creek, Plumas County	18,000
D. N. Rogers	July 26	Bear, Schneider, Big, Clear and Mill creeks, Plumas County	18,000
E. H. Farrar	July 26	Indian Creek, Plumas County	18,000
W. G. Hottman	July 26	Kellog and Mill creeks, Plumas County	24,000
G. N. Johnston	July 26	Smith Creek and Feather River, Plumas County	12,000
Chas. Jones	July 26	Frazier Creek, Plumas County	12,000
W. D. Bernheim	July 26	Jamison Creek, Grass, Wade and Jamison lakes, Plumas County	24,000
W. H. Williamson	July 26	Chipp, Yellow and Mosquito creeks, Plumas County	12,000
Strong & Dickinson	Sept. 30	Strawberry Creek, Riverside County	10,000
Jas. A. Vale	Sept. 24	Lytle, Waterman, Deep and City creeks, San Bernardino County	75,000
W. M. Pearce	Sept. 30	Cucamonga Creek, San Bernardino County	5,000
Ocean Shore Railway Co.	Aug. 3	Purissima Creek, San Mateo County	48,000
H. J. Abels	Sept. 5	Manzana Creek, Santa Barbara County	10,000
C. L. Watson	July 30	Clear Creek, Shasta County	6,000
I. O. Jillson	July 30	Crystal, Clenis and Willow creeks, Shasta County	18,000
Harmon Bell	Aug. 13	Sacramento River, Shasta County	30,000
Dunsmuir Commercial Club	Aug. 24	Soda, Big Castle, Flume, Mears, Hazel, and Shotgun creeks, Shasta County	232,500
Kennett Athletic Club	Sept. 14	Big Backbone Creek, Shasta County	4,500
Mrs. Geo. W. Kenney	July 7	Lake Independence, Sierra County	12,000
F. J. Hunger	July 26	Sulma Creek, Sierra County	6,000
A. H. Walton	July 26	North and South forks Yuba River, Sierra County	18,000
A. S. Nichols	Sept. 14	Cool and Miller creeks, Sierra County	7,500
A. P. Wright	July 22	Mt. Eddy Lakes, Siskiyou County	3,000
O. E. Pile	Aug. 23	Butte Creek, Siskiyou County	12,000
Dunsmuir Commercial Club	Aug. 24	Little Castle Creek, Siskiyou County	17,500
D. M. Swobe	Aug. 25	Mouth of Dry Creek, Siskiyou County	30,000
McCloud River Railway	Aug. 30	McCloud River, Siskiyou County	12,500
Wm. J. Bray	Sept. 1	Antelope Creek, Siskiyou County	9,000
Ed F. Jared	Sept. 2	Shasta River, Siskiyou County	7,500
W. E. Tebbe	Sept. 19	Salmon River, Siskiyou County	2,000
J. H. Hoerl	Sept. 28	Sullaway Creek, Siskiyou County	5,000
W. E. Tebbe	Oct. 9	South and Main branches Etna Creek, Siskiyou County	5,000
Geo. Neale	Aug. 8	Mill Creek, Tehama County	6,000
Bly & Wooley	Aug. 13	Mill Creek, Tehama County	18,000
E. C. Powell	Aug. 13	Antelope Creek, Tehama County	18,000
C. E. Carr	July 30	East Fork Lake, Trinity County	18,000
Elias Ellery	Sept. 18	Swift Creek, Trinity County	12,000
Porterville Fish and Game Association	Sept. 10	Redwood and Jennie creeks, Kessing branch and North Fork Tule River, Tulare County	25,000
Tule River Shooting and Fishing Club	Sept. 10	Casy and Belknap creeks and Tule River, Tulare County	15,000

SISSON HATCHERY—Continued.

Fish Distribution, Season 1913.

DISTRIBUTION OF RAINBOW TROUT—Continued.

Applicant	Date	Waters stocked	Number
Widgeon Gun Club	Sept. 10	Upper South Fork Kaweah River, Tulare County	22,500
Deer Creek Fish and Game Protective Association	Sept. 10	North and South Deer creeks, Tulare County	10,000
Berry & Cramer	Sept. 10	Poso Creek, Tulare County	5,000
D. E. Roberts	Sept. 14	North Fork Stanislaus River, Tuolumne County	7,500
J. B. Curtin	Sept. 14	South Fork Tuolumne River, Tuolumne County	10,000
G. F. Conlin	Sept. 14	South Fork Stanislaus River, Tuolumne County	12,500
L. H. Elliott	Sept. 14	Main Fork Stanislaus River, Tuolumne County	10,000
J. A. Rasmussen	Sept. 24	Conejo and Tapo creeks and Ventura River, Ventura County	20,000
W. E. Sullivan	Sept. 24	Agua Blanca, Ventura County	10,000
E. D. Silent	Sept. 30	Truinfo Creek, branch of Malibu, Ventura County	5,000
Fillmore Chamber of Commerce	Sept. 30	Sespe Creek, Ventura County	10,000
		Held in ponds, Sisson hatchery	70,500
		Total	2,073,500

SISSON HATCHERY—Continued.

Fish Distribution, Season 1913.

DISTRIBUTION OF STEELHEAD TROUT.

Applicant	Date	Waters stocked	Number
Lagunitas Rod and Gun Club	Aug. 9	Lagunitas, Swede George and Cataract creeks, Marin County	30,000
California Anglers' Association	Aug. 9	Lake Lagunitas, Oema and Paper Mill creeks, Marin County	120,000
California Anglers' Association	Sept. 5	Lake Lagunitas, Redwood Canyon, Steep Ravine, Lagunitas and Bolinas creeks, Marin County	65,000
California Western Railway and Navigation Co.	July 14	Main, North Fork and Little North Fork Noyo River, Burlick, Redwood, Alpine and Pudding creeks, Mendocino County	300,000
Geo. L. Hamer	July 21	North Mill Creek, Mendocino County	24,000
B. J. Reilly	July 21	Redwood and Elder creeks, Mendocino County	24,000
Mendocino State Hospital	July 21	South Mill Creek, Mendocino County	24,000
John L. Orr	July 21	South Fork Big River, Mendocino County	24,000
B. H. Miller	July 21	Robertson Creek, Mendocino County	30,000
Dr. C. O. Edwards	July 21	Indian Creek and Navaro River, Mendocino County	36,000
E. L. Waldteufel	July 21	Jack Smith Creek, Mendocino County	24,000
G. A. Johnson	July 21	Cole Creek, Mendocino County	30,000
C. N. Cox	July 21	Orr Creek, Mendocino County	30,000
W. O. White	July 21	Reeves Mill Creek, Mendocino County	30,000
E. E. Holbrook	July 21	East Branch Russian River, Mendocino County	24,000
J. L. D. Roberts	Sept. 6	Big and Little Sur and Carmel River, Monterey County	62,500
Clyde H. Drake	Aug. 27	Ritchie Creek, Napa County	36,000
Wm. West	Aug. 27	Napa Creek, Napa County	57,000
Ocean Shore Railway	Aug. 3	Lobitos and Tunitas creeks, San Mateo County	117,000
H. J. Abels	Sept. 5	Sisquoc and Santa Ynez, Santa Barbara County	25,000
I. L. Koppel	Aug. 2	Penetentia, Stevens, Almaden, Smiths, Campbell and Los Gatos creeks, Santa Clara County	135,000
I. L. Koppel	Sept. 5	Los Gatos and tributaries, Almaden, Ysabel and Campbell creeks, Santa Clara County	50,000
California Anglers' Association	Aug. 9	Austin, Ward, Graham Canyon, Sonoma and Hooker creeks, Sonoma County	93,000
		Total	1,390,500

SISSON HATCHERY—Continued.

Fish Distribution, Season 1913.

DISTRIBUTION OF BLACK SPOTTED TROUT.

Applicant	Date	Waters stocked	Number
T. F. Dunnaway	Aug. 14	Goose Lake, Modoc County	12,000
A. P. Wright	July 22	Mt. Eddy Lakes, Siskiyou County	3,000
Walker & Barnum	Oct. 9	Mill, French, Kelsey and Etna creeks, Siskiyou County	24,000
Fish and Game Commission	Oct. 21	Schoolhouse Spring Creek, Siskiyou County	29,000
H. E. Stock	Sept. 18	Twin Lakes, Trinity County	24,000
		Total	92,000
Landlocked salmon retained in ponds at Sisson hatchery			7,835
Grayling retained in ponds at Sisson hatchery			40,000

TAHOE HATCHERIES.

Fish Distribution, Season 1913.

DISTRIBUTION OF BLACK SPOTTED TROUT—Continued.

Applicant	Date	Waters stocked	Number
Lawrence & Comstock	June 30	Tallac and Taylor creeks, El Dorado County	80,000
Glen Alpine County	July 1	Susie Lake, El Dorado County	40,000
Glen Alpine County	July 2	Half Moon Lake, El Dorado County	40,000
Glen Alpine County	July 3	Grass Lake, El Dorado County	40,000
Glen Alpine County	July 7	Heather Lake, El Dorado County	40,000
Lawrence & Comstock	July 7	Taylor Creek, El Dorado County	50,000
Lawrence & Comstock	July 8	Taylor Creek and Power House Ditch, El Dorado County	84,690
Lawrence & Comstock	July 9	Green Bay, Fallen Leaf Lake and Cascade Lake, El Dorado County	100,000
Lawrence & Comstock	July 10	Taylor and Tallac creeks, El Dorado County	66,300
Bert Ganley	July 10	Little Truckee River, El Dorado County	50,000
Lawrence & Comstock	July 12	Cascade Lake, El Dorado County	50,000
Lawrence & Comstock	July 14	Tallac Creek and Green Bay, Fallen Leaf Lake, El Dorado County	100,000
Lawrence & Comstock	July 16	Tallac and Taylor creeks, El Dorado County	67,795
Lawrence & Comstock	July 17	Tallac Creek, El Dorado County	50,000
Lawrence & Comstock	July 18	Taylor Creek, El Dorado County	50,000
Lawrence & Comstock	July 21	Tallac and Taylor creeks and Green Bay, Fallen Leaf Lake, El Dorado County	185,000
Lawrence & Comstock	July 22	Power House Ditch, El Dorado County	61,350
Chas. Celio	Sept. 27	Grass Lake, El Dorado County	3,000
Jas. Bryson	Sept. 27	Echo Lake, El Dorado County	40,000
H. E. Wilson	Aug. 5	Donner Lake, Nevada County	32,000
H. E. Wilson	Aug. 6	Donner Lake, Nevada County	35,000
F. M. Rutherford	Sept. 9	Summit Lake, Nevada County	12,000
M. J. Rutherford	Sept. 22	Frog Lake, Nevada County	12,000
Fish and Game Com.	Aug. 1	Slim Jim and Ward creeks and Truckee River, Placer County	135,000
Fish and Game Com.	Aug. 2	Blackwood Creek, Placer County	60,000
Fish and Game Com.	Aug. 19	Slim Jim Creek, Placer County	60,000
H. M. Freeman	Aug. 21	Stirling Lake and lakes adjoining, Placer County	30,000
H. M. Freeman	Aug. 23	Fordyce Creek, Placer County	28,030
Fish and Game Com.	Aug. 31	Burton Creek, Placer County	7,355
Fish and Game Com.	Sept. 12	Blackwood Creek, Placer County	20,000
Fish and Game Com.	Sept. 17	Ward and Blackwood creeks, Placer County	60,000
Fish and Game Com.	Sept. 18	Slim Jim Creek, Placer County	50,000
S. J. Boughman	Sept. 22	Buck Lake, Placer County	18,000
Murphy Bros. & Morgan	Sept. 24	Hank Richardson and Miller lakes, Placer County	30,000
Chas. Paine	Sept. 24	Griffin Creek, Placer County	28,460
Murphy Bros. & Morgan	Sept. 26	Miller Lake, Placer County	27,000
Murphy Bros. & Morgan	Sept. 29	McKinney Creek, Placer County	18,000
Albert Caldwell	Sept. 29	Little Rock Bound Lake, Placer County	3,540
Mrs. Kenny	Aug. 8	Independence Lake, Sierra County	40,000
Wm. C. Murdoch	Aug. 23	Webber Lake, Sierra County	12,000
Wm. C. Murdoch	Aug. 24	Webber Lake, Sierra County	15,000
Wm. C. Murdoch	Aug. 29	Webber Lake, Sierra County	15,000
Wm. C. Murdoch	Sept. 9	Webber Lake, Sierra County	15,000
		Total	1,961,520

TAHOE HATCHERIES—Continued.

Fish Distribution, Season 1913.

DISTRIBUTION OF LARGE LAKE TROUT.

Applicant	Date	Waters stocked	Number
Lawrence & Comstock	July 25	Power House Ditch, El Dorado County	9,887
Lawrence & Comstock	July 25	Tallac Creek, El Dorado County	11,079
C. A. Swisler	Sept. 15	Echo Lake, El Dorado County	8,000
F. M. Rutherford	Sept. 9	Summit Lake, Nevada County	4,000
M. J. Rutherford	Sept. 22	Frog Lake, Nevada County	4,183
H. M. Freeman	Aug. 23	Stirling Lake and lakes adjoining, Placer County	8,000
Wm. C. Murdoch	Aug. 23	Webber Lake, Sierra County	12,000
Wm. C. Murdoch	Aug. 24	Webber Lake, Sierra County	12,000
Wm. C. Murdoch	Aug. 29	Webber Lake, Sierra County	12,000
Wm. C. Murdoch	Sept. 9	Webber Lake, Sierra County	6,000
		Total	87,149

DISTRIBUTION OF RAINBOW TROUT.

Glen Alpine Company	July 26	Susie and Half Moon lakes and Glen Alpine Creek, El Dorado County	12,500
Lawrence & Comstock	July 27	Cascade Lake, El Dorado County	20,000
Bert Gandlee	July 29	Cold Stream, El Dorado County	5,000
Fish and Game Com.	July 31	Truckee River, Placer County	10,718
		Total	48,218

DISTRIBUTION OF EASTERN BROOK TROUT.

Frank Pomin	Sept. 15	Meeks Creek, El Dorado County	5,000
Albert Caldwell	Sept. 15	Little Rock Bound Lake, Placer County	5,000
Lake Tahoe Railway and Transportation Co.	Sept. 17	Ward Creek, Placer County	3,000
Chas. Paine	Sept. 24	Griffin Creek, Placer County	5,000
Lake Tahoe Railway and Transportation Co.	Sept. 28	Blackwood Creek, Placer County	2,000
Albert Caldwell	Sept. 29	Little Rock Bound Lake, Placer County	2,850
		Total	22,850

BROOKDALE HATCHERY.

Fish Distribution, Season 1913.

DISTRIBUTION OF STEELHEAD TROUT.

Applicant	Date	Waters stocked	Number
Santa Cruz County	Apr. 25	Mill Creek, Santa Cruz County	2,000
Santa Cruz County	May 8	Wilder, Baldwin, Laguna and Majors creeks, Santa Cruz County	20,000
Santa Cruz County	May 9	Corralitos and Browns creeks, Santa Cruz County	12,000
Santa Cruz County	May 12	Hazel Dell Creek, Santa Cruz County	11,000
Santa Cruz County	May 13	Middle Fork Corralitos Creek, Santa Cruz County	11,000
Santa Cruz County	May 14	Headwaters Soquel Creek, Santa Cruz County	10,000
Santa Cruz County	May 15	Corralitos and Blackburn creeks, Santa Cruz County	12,000
Santa Cruz County	May 16	Soquel Creek, Santa Cruz County	10,000
Santa Cruz County	May 17	McGrath Creek, Santa Cruz County	9,000
Santa Cruz County	May 21	Scott Creek, Santa Cruz County	6,000
Santa Cruz County	May 26	Lidell, Yellow Bank, Molino and Mill creeks, Santa Cruz County	20,000
Santa Cruz County	May 27	Branciforte and Soquel creeks, Santa Cruz County	16,000
Santa Cruz County	May 31	Soquel Creek, Santa Cruz County	20,000
Santa Cruz County	June 6	San Lorenzo River and Boulder Creek, Santa Cruz County	30,000
Santa Cruz County	June 7	Soquel Creek, San Lorenzo River and Boulder Creek, Santa Cruz County	46,000
Santa Cruz County	June 11	Aptos and Kings creeks, Santa Cruz County	33,000
Santa Cruz County	June 12	San Lorenzo River, Santa Cruz County	42,000
Santa Cruz County	June 13	Soquel and Bear creeks, Santa Cruz County	31,000
Santa Cruz County	June 14	Fall and Zayante creeks, Santa Cruz County	21,000
Santa Cruz County	June 17	Bean Creek, Santa Cruz County	12,000
Santa Cruz County	June 18	Wadell Creek, Santa Cruz County	12,000
Santa Cruz County	June 19	Wadell and Laguna creeks, Santa Cruz County	18,000
Santa Cruz County	June 22	Zayante Creek, Santa Cruz County	10,000
Santa Cruz County	June 23	Zayante and Gold Gulch creeks, Santa Cruz County	10,000
Santa Cruz County	June 25	Wadell Creek, Santa Cruz County	12,000
Santa Cruz County	June 26	Shingle Mill Creek, Santa Cruz County	2,000
Santa Cruz County	June 28	Scott Creek, Santa Cruz County	15,000
Santa Cruz County	July 1	San Lorenzo River, Santa Cruz County	12,000
Santa Cruz County	July 2	San Lorenzo River, Santa Cruz County	9,000
Santa Cruz County	July 8	Zayante Creek, Santa Cruz County	12,000
Santa Cruz County	July 9	San Lorenzo River and Bear Creek, Santa Cruz County	26,000
Santa Cruz County	July 12	Fall Creek, Santa Cruz County	12,000
Santa Cruz County	July 26	Zayante Creek, Santa Cruz County	11,000
Santa Cruz County	Aug. 18	San Lorenzo River, Santa Cruz County	10,000
Santa Cruz County	Aug. 20	San Lorenzo River, Santa Cruz County	2,000
Santa Cruz County	Aug. 29	San Lorenzo River, Santa Cruz County	10,000
Santa Cruz County	Sept. 3	City Reservoir, Santa Cruz County	4,000
Santa Cruz County	Sept. 6	Fall Creek, Santa Cruz County	2,000
Santa Cruz County	Oct. 5	Shingle Mill Creek, Santa Cruz County	11,000
Santa Cruz County	Oct. 30	San Lorenzo River, Santa Cruz County	19,000
		Total	593,000

DISTRIBUTION OF QUINNAT SALMON.

Fish and Game Com.	July 1	San Lorenzo River, Santa Cruz County	294,660

DISTRIBUTION OF SILVER SALMON.

Fish and Game Com.	July 15	Scott Creek, Santa Cruz County	25,000

PRICE CREEK HATCHERY.

Fish Distribution, Season 1913.

DISTRIBUTION OF QUINNAT SALMON.

Applicant	Date	Waters stocked	Number
Fish and Game Com.	Mar. 8	Mad River, Humboldt County	100,000
Fish and Game Com.	Mar. 6-10	Price Creek, tributary to Eel River, Humboldt County	1,386,500
		Total	1,486,500

SACRAMENTO EXPERIMENTAL STATION.

Fish Distribution, Season of 1913.

DISTRIBUTION OF QUINNAT SALMON.

Applicant	Date	Waters stocked	Number
Fish and Game Com.	Jan. 31	Sacramento River, Sacramento County	359,000

WAWONA HATCHERY.

Fish Distribution, Season 1913.

DISTRIBUTION OF BLACK SPOTTED TROUT.

Applicant	Date	Waters stocked	Number
Fish and Game Com.	July 26	Merced River, Meadow and Chilnoquina creeks, Mariposa County	39,000
Fish and Game Com.	July 27	Merced River, Mariposa County	16,000
Alanzo Wright	July 27	Bigtree Creek, Mariposa County	6,000
J. Washburn	July 28	Chilnoquina Creek, Mariposa County	15,000
J. Washburn	July 29	Bruce Creek, Mariposa County	8,000
J. Washburn	July 30	Merced River, Mariposa County	25,000
J. Washburn	Aug. 2	Meadow Creek, Mariposa County	15,000
J. Washburn	Aug. 4	Big and Laurel creeks, Mariposa County	24,000
J. Washburn	Aug. 5	Merced River, Squirrel and Rush creeks, Mariposa County	30,000
Alanzo Wright	July 27	Big and Ranier creeks, Madera County	24,000
Alanzo Wright	July 28	Hogue and Thompson creeks, Madera County	18,000
		Total	220,000

Following is a summary of the distribution from the different hatcheries for the season of 1913:

SISSON HATCHERY.

Species	Eggs	Loss	Shipped to other stations	Fry shipped and held for breeding	Total shipped and held for breeding
Loch Leven trout	1,352,520	220,020	----------	1,132,500	
Eastern brook trout	990,800	170,300	----------	820,500	
Rainbow trout	2,276,040	92,540	110,000	2,073,500	
Steelhead trout	1,586,000	195,500	----------	1,390,500	
Black spotted trout	100,000	8,000	----------	92,000	
Grayling	50,000	10,000	----------	40,000	
Landlocked salmon	10,000	2,165	----------	7,835	5,556,835
Quinnat salmon	14,547,548	410,481	----------	14,137,067	14,137,067
					19,693,902

TAHOE HATCHERIES.

Black spotted trout	2,500,260	198,740	340,000	1,961,520	
Large lake trout	115,760	28,611	----------	87,149	
Rainbow trout	50,000	1,782	----------	48,218	
Eastern brook trout	23,000	150	----------	22,850	2,119,737

BROOKDALE HATCHERY.

Steelhead trout	2,556,600	366,600	1,597,000	593,000	
Quinnat salmon	300,000	5,340	----------	294,660	
Silver salmon	90,200	65,200	----------	25,000	912,660

PRICE CREEK HATCHERY.

Quinnat salmon	1,500,000	13,500	----------	1,486,500	1,486,500

SACRAMENTO EXPERIMENTAL STATION.

Quinnat salmon	600,000	241,000	----------	359,000	359,000

WAWONA HATCHERY.

Black spotted trout	240,000	20,000	----------	220,000	220,000
Total	----------	----------	----------	----------	24,791,799

SISSON HATCHERY.

Fish Distribution, Season of 1914.

DISTRIBUTION OF QUINNAT SALMON.

Date	Waters stocked	Number
Mar. 2	Cold Creek, tributary to Sacramento River, Siskiyou County	1,500,000
Mar. 15	Cold Creek, tributary to Sacramento River, Siskiyou County	750,000
Apr. 1	Sullaway Creek, tributary to Sacramento River, Siskiyou County	1,150,000
Apr. 1	Cold Creek, tributary to Sacramento River, Siskiyou County	350,000
Apr. 2	Cold Creek, tributary to Sacramento River, Siskiyou County	550,000
Apr. 2	Straits of Carquinez, Solano County	350,000
Apr. 2	Sullaway Creek, tributary to Sacramento River, Siskiyou County	800,000
Apr. 3	Cold Creek, tributary to Sacramento River, Siskiyou County	150,000
Apr. 4	Cold Creek, tributary to Sacramento River, Siskiyou County	2,450,000
Apr. 4	Sullaway Creek, tributary to Sacramento River, Siskiyou County	350,000
Apr. 5	Klamath River, Siskiyou County	330,000
Apr. 7	Klamath River, Siskiyou County	350,000
Apr. 13	Straits of Carquinez, Solano County	335,000
Apr. 16	Sullaway Creek, tributary to Sacramento River, Siskiyou County	400,000
Apr. 16	Klamath River, Siskiyou County	335,000
Apr. 18	Klamath River, Siskiyou County	335,000
Apr. 19	Cold Creek, tributary to Sacramento River, Siskiyou County	277,500
Apr. 19	Straits of Carquinez, Solano County	315,000
Apr. 24	Straits of Carquinez, Solano County	330,000
Apr. 27	Sacramento River, Sacramento County	335,000
Apr. 28	Cold Creek, tributary to Sacramento River, Siskiyou County	2,700,000
Apr. 29	Cold Creek, tributary to Sacramento River, Siskiyou County	300,000
Apr. 30	Cold Creek, tributary to Sacramento River, Siskiyou County	383,000
May 1	Smiths River, Del Norte County	100,000
May 4	Straits of Carquinez, Solano County	330,000
May 5	Spring Creek, tributary to Sacramento River, Siskiyou County	200,000
May 6	Spring Creek, tributary to Sacramento River, Siskiyou County	400,000
May 7	Sullaway Creek, tributary to Sacramento River, Siskiyou County	200,000
May 22	Cold Creek, tributary to Sacramento River, Siskiyou County	139,115
May 25	Cold Creek, tributary to Sacramento River, Siskiyou County	800,000
	*Retained in Klinks Lake, Sisson hatchery	1,900,000
	*Retained in Sisson Lake, Sisson hatchery	2,100,000
	Total	21,294,615

*Fish retained in Klinks and Sisson lakes at Sisson hatchery are being fed until fall, when they will be released in the Sacramento River, in Siskiyou County.

DISTRIBUTION OF SILVER SALMON.

Apr. 5	Klamath River, Siskiyou County	12,500

PRICE CREEK HATCHERY.

Fish Distribution, Season of 1914.

DISTRIBUTION OF QUINNAT SALMON.

Applicant	Date	Waters stocked	Number
Fish and Game Commission	Feb. 7	Price Creek, Humboldt County	100,000
Fish and Game Commission	Feb. 9	Price Creek, Humboldt County	155,000
Fish and Game Commission	Feb. 10	Price Creek, Humboldt County	120,000
Fish and Game Commission	Feb. 11	Eel River, Humboldt County	210,000
Fish and Game Commission	Feb. 13	Eel River, Humboldt County	183,000
Fish and Game Commission	Feb. 14	Eel River, Humboldt County	240,000
Fish and Game Commission	Feb. 15	Eel River, Humboldt County	220,000
Fish and Game Commission	Feb. 16	Eel River, Humboldt County	170,000
Fish and Game Commission	Feb. 18	Price Creek, Humboldt County	280,000
Fish and Game Commission	Feb 19	Price Creek, Humboldt County	200,000
Fish and Game Commission	Feb. 20	Price Creek, Humboldt County	400,000
Fish and Game Commission	Feb. 26	Price Creek, Humboldt County	100,000
Fish and Game Commission	Mar. 6	Price Creek, Humboldt County	42,610
Fish and Game Commission	Mar. 7	Price Creek, Humboldt County	100,000
Fish and Game Commission	Mar. 8	Price Creek, Humboldt County	167,850
Fish and Game Commission	Mar. 9	Price Creek, Humboldt County	26,305
Fish and Game Commission	Mar. 10	Price Creek, Humboldt County	27,235
Fish and Game Commission	Mar. 10	Eel River, Humboldt County	140,000
Arcata Chamber of Commerce	Mar. 27	Mad River, Humboldt County	75,000
Harbor Commissioners, Port of Eureka	Mar. 31	Freshwater Creek, tributary to Humboldt Bay, Humboldt County	37,500
Eureka Chamber of Commerce	Mar. 31	Jacoby Creek, tributary to Humboldt Bay, Humboldt County	37,500
Arcata Chamber of Commerce	Apr. 4	Mad River, Humboldt County	75,000
Arcata Chamber of Commerce	Apr. 7	Mad River, Humboldt County	75,000
Fish and Game Commission	Apr. 10	Eel River, Humboldt County	691,000
Eureka Chamber of Commerce	Apr. 10	Elk River, tributary to Humboldt Bay, Humboldt County	75,000
		Total	3,948,000

Following is a summary of the number of fish eggs taken and the number of fry which would be available for distribution during the season of 1914:

SISSON HATCHERY.

Species	Eggs	Loss estimated	Shipped to other stations	Available for distribution estimated	Total available for distribution estimated
Loch Leven trout	1,818,840	144,840	----------	1,674,000	
Eastern brook trout	1,169,750	116,750	----------	1,053,000	
Rainbow trout	1,101,850	44,850	----------	1,057,000	
Steelhead trout	2,250,000	121,000	----------	2,250,000	
Black spotted trout	1,910,000	130,000	----------	1,780,000	
Large lake trout	20,000	2,000	----------	18,000	7,832,000
Quinnat salmon	21,702,645	408,030	----------	21,294,615	
Silver salmon	95,840	3,340	80,000	12,500	21,307,115
Total	----------	----------	----------	----------	29,139,115

TAHOE HATCHERIES.

Black spotted trout	5,336,100	326,100	2,128,000	2,882,000	
Large lake trout	212,800	53,200	44,600	95,000	2,977,000

PRICE CREEK HATCHERY.

Steelhead trout	410,000	4,000	----------	406,000	
Quinnat salmon	4,083,250	135,250	----------	3,948,000	4,354,000

UKIAH HATCHERY AND SNOW MOUNTAIN EGG COLLECTING STATION.

Steelhead trout	1,813,480	382,480	881,000	550,000	550,000

WAWONA HATCHERY.

Black spotted trout	218,000	18,000	----------	200,000	
Large lake trout	24,600	2,600	----------	22,000	222,000
Total	----------	----------	----------	----------	37,242,115

REPORT OF SUPERINTENDENT OF GAME FARM.

By W. N. Dirks.

The scarcity of wild game, and the demand that there is from the non-hunting public for something to take the place of the game that was formerly commonly served at all hotels and resorts throughout our state, has opened up a new field for the pheasant breeder. The ringneck pheasant is not only one of the best of game birds, but also takes very kindly to domestication and can be reared by careful breeders with scarcely more difficulty than ordinary poultry. The prices that are obtained for young pheasants has made the breeding of pheasants very attractive to many people throughout the state, and in time should be an important addition to its industries. In the hope that the experience we have gained at the state game farm during the past several years may be of benefit to the public, we offer a few suggestions for the handling of pheasants and other game birds in confinement.

Since the inception of the game farm, approximately five thousand pheasants have been raised. Most of these have been liberated in the various parts of the state climatically adapted to them. It has not been the intention of the commission to enter into competition with private breeders and practically no birds have been sold.

Selecting of Breeding Stock.

It has been our practice to hold the largest and most vigorous birds from the early hatch for breeders the following year. These birds seem to be stronger in every way than those from hatches later in the season. It is well to exchange birds with other parties having a different strain of stock to prevent any evil effects that might arise from inbreeding.

Breeding Pens.

As the breeding birds will be held for approximately five months during the laying season, it is essential that they be placed in pens that can be easily moved to new ground. Very satisfactory pens can be built of equal size panels covered with inch mesh wire and secured at the corners with butterfly bolts. A baseboard at least a foot high on each panel will add strength and durability to the pens. In the corner of one panel a door large enough to admit the entrance of the attendant should be constructed. Panels can be placed across the top, or poultry wire can be stretched and fastened temporarily. A pen of six birds should have a ground space of at least 144 square feet. The takedown pens have the additional advantage that they can be segregated should there be any need of keeping the birds apart on account of disease. They can also be easily cleaned and disinfected.

Feed for Breeding Stock.

Any standard brand of poultry scratch feed, together with plenty of greens, grit and dust will be found satisfactory. Over feeding is to be guarded against, and the pens should never be littered with stale food. An abundance of fresh water should be available at all times.

Breeding Season.

The breeding stock should be placed in their allotted pens by the first of February, or as soon as they show any inclination to mate. In our experience, we have found that the best results can be obtained from confining not to exceed five hens with each male bird, although good results can sometimes be obtained by using a greater number of hens; but under average conditions this is not advisable. Eggs may be expected by the middle of March. Between this time and the middle of July, each hen should lay approximately sixty eggs. These eggs should be gathered twice a day and placed in a cool, well ventilated room on shelves covered with a half inch of sand to prevent them from rolling about. In order to avoid the confusion of having several small hatches coming off every few days, we make a practice of setting every ten or twelve days. This permits us to give our entire attention to one lot of young birds during the most critical period, namely, the first ten days. We have found that holding the eggs for this length of time is not detrimental in any way. It should be remembered that in the wild state the hen pheasant will lay an egg a day over a period of from two to three weeks. She does not commence to set until the last egg is laid, and almost invariably every egg will hatch.

Setting.

Our experience with the incubator has proven to our satisfaction that the domestic chicken or turkey is preferable. We have had excellent results from combining both. Eggs have been placed under hens for the first half of the period of incubation and then tested for fertility and the fertile eggs transferred to the incubator. As the eggs are taken from the hens, they are placed in a basket and the hens are then reset on fresh eggs. The number of eggs given each hen is governed by the ability of the hen to cover them satisfactorily. When setters are scarce, we ordinarily place as many as twenty-five under each hen. Bantams will cover only fifteen and a hen turkey will cover satisfactorily as many as thirty-five.

Eight hens are placed in one compartment, the nests being on the ground and separated by a four-inch board. By this arrangement only one drinking fountain is necessary. There is also a reduction in the number of feed pans, dust boxes, etc., and the extra work in attending to them. It is necessary, however, for the attendant to keep careful

watch to see that the setting hens do not "double up," thereby leaving a setting of eggs uncovered, so that they become chilled.

Great care should be taken in the selection of the brooding hens. No birds should be selected that can not be handled. Nervous, easily frightened birds will fly off the nest at the approach of the attendant and will destroy more eggs than the hen is worth. Before setting, the hen should be free of all vermin, and only healthy fowls should be selected.

Incubation.

Pheasant eggs are tested for fertility in the same manner as the ordinary hen egg. The fertile eggs are placed in the incubator for the

Two bird-killers—house cat and weasel.

remaining period of incubation, and the infertile ones can be set aside to be used later for food for the young chicks. The incubating period varies between twenty-three to twenty-four days. We have used California made incubators equipped with moisture pans kept partially full of water during the entire season. The bulb of the thermometer is placed even with the top of the eggs, the temperature registering from 101 to 103 degrees Fahrenheit. We have found that the temperature can vary to a considerable extent without any serious results in the hatch. Eggs should be allowed to cool in the morning and evening up to the time of hatch. While most lots of eggs are moved or scrambled about at each cooling, we have had the same percentage of hatches from

lots that have not been turned at all during the period of time while in the incubators.

Brooding.

During the season of 1912-13, all birds, with the exception of a few small lots whose numbers did not warrant the expense of operating artificial brooders, were brooded in brooders of various makes. The fireless brooder equipped with feather dusters gave excellent satisfaction with small lots, but scores of birds were confined together and a large number were lost through piling up. One of the chief objections to this style of brooder is the fact that the chicks must be forced in, there being no artificial heat to attract them. When there are many birds to be taken care of, it has been found more satisfactory to use a brooder with artificial heat. There are various makes of oil heaters on the market, all of which should give good results.

During the season of 1914, owing to uncertainty as to whether the game farm would be permanently maintained, we have only a very small breeding stock and are using hens exclusively for brooders. When this is done, it is absolutely essential that they be cleaned of all vermin, as nothing is more fatal to the pheasant chicks than vermin. Large, clumsy hens are to be condemned, as they kill many chicks by stepping on them.

As soon as the chicks are thoroughly dry, they are placed in baskets and given to the hens that are to take care of them. A close watch is kept to see that they are adopted, after which each family is transferred to its individual brooding coop. Some hens will show a positive dislike towards caring for the chicks. Such hens should be reset and not given the young birds until they will take care of them.

The brooding coops are constructed of twelve-inch redwood boards, with a shed roof on one end to afford shelter at night. The open portion should be covered with poultry wire of small enough mesh so that the young birds can not get out. The brooding pens are open at the bottom and are transferred to fresh ground from day to day. If confined to the same place for any length of time, the birds will quickly become weakened and not be able to withstand disease. Water is an essential requirement and a clean supply should be available at all times. Several makes of excellent chick fountains can be purchased. When the coops are set on grass plots, it is not necessary to feed other greens, otherwise lettuce, kale, or Swiss chard or some other greens should be given every day. We feed a standard variety of chick food, mixed with ground hard boiled eggs, in the proportion of twelve eggs to one gallon of food. This preparation is given for about two weeks, and then gradually cut down until the birds are eating straight feed at three weeks of age. In

addition to this, we feed dried house flies freely. They are trapped in wire fly traps and roasted and put in the sun to dry.

Maggots make an ideal, economical food that is readily taken by the young birds and is highly recommended by all pheasant breeders. Maggots can be reared without any great amount of trouble, by placing meat in a box, one end of which has been replaced by inch mesh wire. The box should be raised a foot from the ground and underneath the wire should be placed a bucket or tub, the bottom of which is covered with an inch of dry bran. The meat will quickly become "fly blown" and thoroughly infested with maggots. As they reach maturity, they will drop from the open end of the box into the bran of the bucket, where they dry off and can be fed to the young birds. A number of these maggot "factories" can be started at intervals, so as to maintain a constant supply of food.

A small box of sand or dust is kept in each coop, in which the chicks may dust themselves, thus keeping down any vermin that may not have been destroyed. The chicks should be confined in these coops until they are at least three weeks old. When moved to a larger pen, if the hen shows any tendency to neglect the chicks, they should be put back in the smaller pen until large enough to get along without her care. From the brooding pens, we have found it wise to put the flock in pens similar to those in which the breeding stock has been confined.

Shelter should be arranged so that the birds may during the stormy weather in the winter, if they desire, get under cover. A strip of roofing paper or oil canvas stretched over part of the top and along the upper part of the back of a series of pens will make an ideal shelter. Underneath this, perches or roosts can be constructed. The growing birds can be fed the regular poultry scratch food alternated with whole corn.

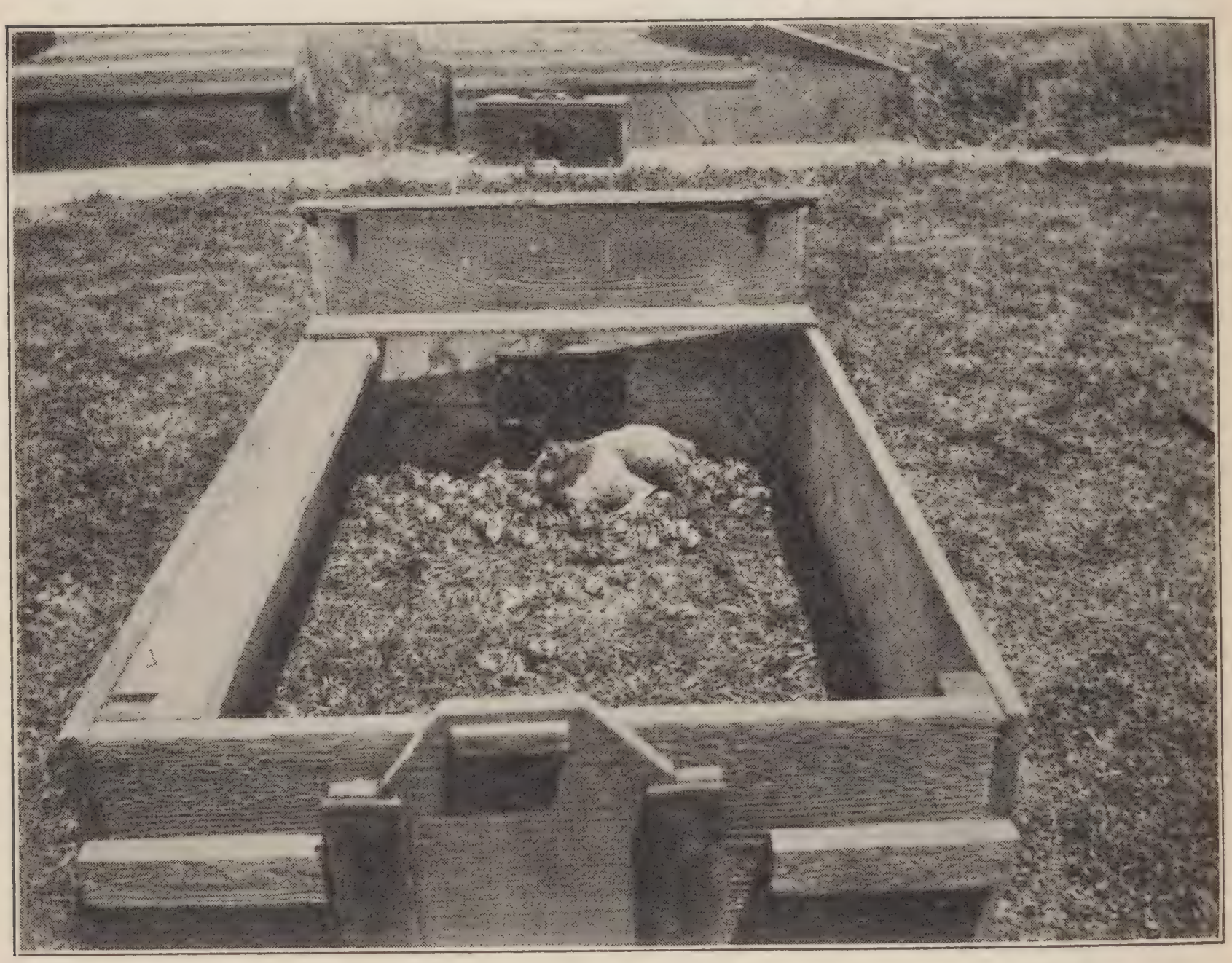
Valley Quail.

We have carried on during the past two years a number of experiments in the breeding of valley quail. During the season of 1913, part of our breeding stock was confined in pens similar to the pheasant pens, five females with one male. The others were held in a large enclosure. While the number of eggs secured was practically the same per bird in both lots, the fertility was somewhat better in those taken from the larger pen.

During the season of 1914, all of the quail have been confined in one cage, the eggs gathered day by day and held in the same manner as the pheasant eggs; in fact, with the exception of the incubation, the eggs and young quail are handled in exactly the same manner as the pheasants.

The period of incubation varies between twenty-three to twenty-four days. The water pan is kept full during the entire period, thus maintaining an equal amount of humidity during the entire period. The temperature may vary a number of degrees, some incubators registering at times as high as 105 degrees.

Quiet, bantam hens make excellent setters and brooders and where the number of eggs does not warrant the use of an incubator, they can be depended upon to hatch every fertile egg. On the twenty-second day of incubation, the hen should be confined in such a way that it will be absolutely impossible for the young birds to stray more than a few



Hen with brood of young valley quail at State Game Farm.

inches from the nest; otherwise they will go so far that they will not be able to find their way back, not understanding the cluck of the hen. At this time they need the heat that they secure from the mother hen and quickly die if chilled. Care should be taken that all holes are closed, as the young quail can make their way through an exceedingly small opening. After the young quail are thoroughly dry, they may be moved with the hen to the brooding coop, as illustrated in an accompanying cut. We have not found an artificial brooder that can compare in results secured with the ordinary hen.

The chicks should remain with the hen until fully grown, but should be moved at about six weeks of age to larger pens.

In a small way, good results can be obtained by allowing the female quail to select her own nest and hatch the eggs. If left to herself, practically every chick will be raised, but if molested or interfered with, she will neglect the little ones and they will quickly suffer.

Sometimes a male quail will take it upon himself to incubate the eggs and take care of the chicks. In one instance, a male confined with five females sat for the entire period, without any assistance from the females, and hatched eight eggs, leaving fifteen eggs still in the nest. These were put in an incubator and hatched at intervals until all the chicks had come out. This was due, we believe, to the fact that the different hens had laid in the nest while the male was setting. In another instance, a male bird hatched eleven young from a nest in a large cage where over fifty pair of quail were confined.

In the rearing of quail, one of the most important lessons to be learned is the fact that quail can not be confined on ground to which chickens, turkeys or pheasants have previously had access. Quail are particularly susceptible to the poultry diseases, and these diseases are very fatal to them.

Ducks.

We have at the game farm a number of wild ducks—spoonbill, sprig and mallards. Of these, the only species that has shown any inclination to breed in confinement is the mallard. The mallards will incubate their own eggs, or the eggs can be hatched in incubators. The other varieties named show no desire to mate. Young mallards can be given the same treatment as domestic ducks. They are strong and healthy and require comparatively little attention. If they are confined in open pens, the ducklings must be pinioned at an early age, or they are apt to take wing and fly away as soon as the migrating season is on.

STATE GAME FARM, HAYWARD.

Distribution of game birds, July 1, 1912, to June 30, 1914.

Alameda County.

Date	Applicant	Address	Pheasants	Quail	Wild turkeys
1912					
Aug. 10	C. J. Smith	Oakland	[3]2		
Sept. 16	C. L. Crellin	Pleasanton	[1]50		
Dec. 27	Alameda County Infirmary	Oakland	[3]5		
Dec. 20	C. J. Smith	Oakland	[3]4		
1913					
Jan. 4	H. A. Snow	Newark	[3]2		
Feb. 11	C. L. Crellin	Pleasanton	[3]4		
Feb. 12	H. C. Cutting	San Lorenzo	[3]3		
Mar. 7	Mrs. S. Mathiassen	San Lorenzo	[3]1		
May 1	California Pheasantry	Oakland	[4]20		
May 7	Jacob Harder	Hayward		[1]4	
May 30	California Pheasantry	Oakland	[4]8		
June 2	H. C. Cutting	San Lorenzo	[3]150 eggs		
Aug. 3	Dr. C. J. Schilling	Oakland		[2]4	
Aug. 16	Geo. Vargas	Hayward	[3]2		
Sept. 28	Mortimer Smith	Oakland		[1]6	
Sept. 29	J. E. Bairos	Pleasanton	[4]3		
Sept. 29	E. E. Hall	Pleasanton	[4]4		
Aug. 28	F. C. Clarke	Berkeley	[2]1		
Oct. 2	DeWitt Dougherty	Pleasanton	[4]2		
Oct. 2	Bert L. Curtis	Oakland		[1]4	
Oct. 27	Walter Haar	Hayward	[4]2		
Nov. 17	Dr. C. P. Paston	Berkeley	[3]9		
Dec. 2	Dr. J. A. Hill	Oakland	[3]2		
1914					
Feb. 28	Fred Hoyt	Hayward		[3]12	
Mar. 1	H. A. Snow	Newark	[3]5		
Mar. 2	D. C. Peters	Hayward		[3]14	
Apr. 12	Miss C. Pastdorf	Hayward	[3]2		
May 8	Herman Hess	Mt. Eden	[3]2		
May 7	P. Versiz	Hayward	[3]12 eggs		
June 19	Jacob Harder, Jr.	Hayward	[3]6		

Colusa County

1913					
Dec. 29	J. W. Forgens	Williams	[1]120		

Del Norte County.

1912					
Sept. 25	Paul Smith	Requa	[1]100		
1913					
Sept. 10	Paul Smith	Requa	[1]200		

Fresno County.

1912					
Sept. 2	J. P. Shellenbarger	Sanger	[1]100		
Sept. 23	F. A. Bullard	Sanger	[1]60		
1913					
Sept. 21	Mrs. S. P. Frisselle	Fresno	[4]2		

Humboldt County.

1912					
Aug. 24	Earl P. Barnes	Eureka	[1]100		
Aug. 24	Earl P. Barnes	Eureka			[1]50

STATE GAME FARM, HAYWARD.

Distribution of game birds, July 1, 1912, to June 30, 1914—Continued.

Inyo County.

Date	Applicant	Address	Pheasants	Quail	Wild turkeys
1913 Mar. 19	E. H. Ober	Big Pine	[1]16		

Kern County.

1913 Dec. 11	Jesse Peter	Pond	[4]2		

Lake County.

1913 Jan. 16	Lyon Fraser	Lakeport	[1]80		

Lassen County.

1912 Sept. 4	Frank P. Cady	Susanville	[1]100		
Sept. 21	Geo. Wingfield	Janesville		[1]50	
Sept. 13	A. J. Hall	Doyle			[3]1

Los Angeles County.

1913 Sept. 30	S. M. Morgan	Los Angeles	[4]2		
Oct. 6	S. M. Morgan	Los Angeles	[4]4		
Dec. 13	Hugh D. Corrough	Los Angeles	[4]2		
1914 Feb. 2	Griffith Park	Los Angeles	32 (Exhibition)		

Madera County.

1914 Mar. 2	County Park	Madera	1 (Exhibition)		

Marin County.

1912 Nov. 23	V. D. Thomas	Ignacio	[1]25		
1914 Mar. 24	W. S. Leake	Ross	[3]2		

Mendocino County.

1912 Sept. 13	B. H. Miller	Ukiah	[1]50		

Monterey County.

1912 Aug. 12	Phil Oyer	Pacific Grove	[1]100		
1913 Dec. 8	Phil Oyer	Pacific Grove	[1]100		

STATE GAME FARM, HAYWARD.

Distribution of game birds, July 1, 1912, to June 30, 1914—Continued.

Napa County.

Date	Applicant	Address	Pheasants	Quail	Wild turkeys
1912					
Sept. 13	W. J. Moore	Napa	[1]50		
Sept. 18	John McCormick	St. Helena	[1]50		

Nevada County.

1912					
Sept. 18	Dr. I. W. Hays	Grass Valley			[1]30
1913					
Sept. 21	Richard Noel, Sr.	Grass Valley	[4]2		

Placer County.

1912					
Dec. 12	Lawrence & Comstock	Lincoln	[2]1		
Sept. 5	M. Godley	Lincoln			[1]25
1913					
Sept. 3	H. O. Comstock	Lincoln	[1]6		

Sacramento County.

1912					
Oct. 7	M. Locke	Walnut Grove	[1]50		
1913					
Aug. 28	Louis Meiss Estate Co.	Clay	[1]24		
Sept. 12	George Neale	Sacramento (Grand Island)	[1]42		
Sept. 21	H. A. Alspach	Sacramento (McKinley Park)	2	(Exhibition)	
Sept. 21	Mrs. Shick	Sacramento	[4]2		
Sept. 21	J. E. Short	Sacramento	[4]2		
Oct. 20	Natomas Consolidated	Sacramento	[1]82		
Oct. 20	Geo. Locke	Walnut Grove	[1]84		
Oct. 20	Jos. Green	Courtland	[1]86		

San Benito County.

1912					
Aug. 20	J. H. Hill	Hollister			[1]50
Sept. 9	J. Lee Jones	Tres Pinos	[1]100		
1913					
Sept. 30	J. H. Hill	Hollister	[1]100		
Dec. 17	Dr. H. J. Macomber	Tres Pinos			[1]3

San Francisco County.

1912					
Aug. 29	D. A. White	San Francisco	[2]2	[2]25	
Sept. 18	Capt. C. A. Gove	Yerba Buena Island	[1]25		
1913					
Oct. 13	W. H. Wubben	San Francisco	[4]2		

STATE GAME FARM, HAYWARD.

Distribution of game birds, July 1, 1912, to June 30, 1914—Continued.

San Luis Obispo County.

Date	Applicant	Address	Pheasants	Quail	Wild turkeys
1912 Nov. 2	J. P. Andrews	San Luis Obispo	[3]1		

San Mateo County.

1912 Dec. 26	Jack Boshoff	Pescadero	[1]40		
1913 Apr. 23	W. B. Lawrence	Millbrae		[1]42	

San Joaquin County.

1912 Sept. 5	J. W. Steinbeck	Stockton		[3]2	

Santa Clara County.

1912 Nov. 20	C. R. Harker	San Jose	[3]4		
1913 Mar. 18	George Clark	San Jose	[1]3		
Mar. 18	Gus Lyon	San Martin	[1]3		
Mar. 28	George Clark	San Jose	[1]3		
Apr. 2	F. A. Curtis	San Jose		[3]2	
1914 June 30	F. A. Curtis	San Jose	[3]6		

Santa Cruz County.

1912 Aug. 13	Geo. Martin and H. C. Peckham	Watsonville	[1]50		

Shasta County.

1912 Oct. 4	C. C. McCray	Redding			[1]32

Siskiyou County.

1913 Sept. 1	Dr. A. A. Milliken	Fort Jones	[1]200		

Solano County.

1912 Dec. 17	C. Pardi	Vacaville	[3]2		
Aug. 27	John Hollenbeck	Ryer Island	[1]100		
1913 Dec. 13	Cæsar Pardi	Vacaville	[3]2		

STATE GAME FARM, HAYWARD.

Distribution of game birds, July 1, 1912, to June 30, 1914—Continued.

Sonoma County.

Date	Applicant	Address	Pheasants	Quail	Wild turkeys
1912					
Sept. 15	F. M. Child	Cazadero			[1]25
1913					
Aug. 7	Rufus Steele	Bohemian Grove		[1]25	
Dec. 8	T. C. Reedull	Petaluma	[4]1		

Stanislaus County.

1912					
Aug. 14	Geo. Prowse	Oakdale		[3]1	
1913					
Nov. 2	C. T. Kennedy	Knights Ferry	[4]2		
Nov. 18	C. T. Kennedy	Knights Ferry	[4]2		
Dec. 4	Dr. J. B. Thompson	Oakdale	[4]4		

Sutter County.

1913					
Sept. 21	Dr. Jacobs	Meridian	[4]2		

Tulare County.

1912					
Sept. 1	J. D. Blick	Three Rivers	[1]50		
Sept. 1	Tom Jacobs	Visalia	[1]25		
Sept. 1	Porterville Game Protective Association	Porterville	[1]50		
Sept. 23	Deer Creek Fish and Game Protective Association	Hot Springs	[1]40		
1913					
Mar. 17	Jud Blick	Lemon Cove	[1]1		

Yolo County.

1913					
Apr. 14	University Farm	Davis	[2]150 eggs		
May 17	University Farm	Davis	[2]150 eggs		

Yuba County.

1912					
Nov. 20	Dr. Barr	Marysville		[3]2	
1914					
Jan. 8	W. R. Hendricks	Browns Valley	[4]3		
1913					
Oct. 6	Geo. Wingfield	Reno, Nevada	[4]10		
Nov. 5	B. R. Smith	Portland, Oregon	[4]2		
		Totals	2,655 birds 462 eggs	193	216

[1]Released.
[2]Given for experiment.
[3]Exchange for other birds, etc.
[4]Sold.

REPORTS OF SPECIAL ASSISTANTS.

STREAM SURVEYS AND MAP WORK.

By CHAS. L. GILMORE, Engineer-Draftsman.

Importance of Accurate Knowledge of Streams.

To the State Fish and Game Commission, the importance of a thorough knowledge of the various watersheds of California, their location, runoff, impounding areas, etc., is most essential to the proper conduct of fish and game protection, preservation and propagation.

The whole of the present and future of the fish life of the state depends upon our water resources. Without this natural element of fish life they would entirely disappear from the face of nature; for no artificial method of sustaining fish without water has yet been discovered.

Water Supply and Its Relation to Game.

In the matter of the distribution of game there is a proposition analogous to that of fish. The abundant wildfowl in California that breed within the confines of this state nest in our lake and swamp regions. Their feeding places are in our valleys in our swamp areas, that have, in many instances, indeterminate areas. Our game is most abundant in those portions where streams and lakes are most plentiful and this water results directly in the heavy stand of timber that acts as a natural shelter to the game. Those areas classed as arid and semi-arid and devoid of a natural supply of water are as nothing in importance to the human family in the matter of game when compared with the well watered, heavily timbered mountains or the fertile valleys with their adjacent swamp areas.

Accurate Stream Records Essential.

Knowing and realizing the importance of a knowledge of the water resources of the state to the intelligent despatch of fish and game protective and preservation methods, the present Fish and Game Commission set about obtaining complete and accurate information on this subject.

Since there is but one method of surveying in vogue in the United States, it follows that accurate and authentic maps are the best methods of recording data of the character desired. Further, maps drawn to scale accord with the United States system of land surveys are easily understood, easily used as reference records and may be constructed as complete as may be desired. There is no better or more adequate method of recording the streams, lakes, ditches, canals, reservoirs, etc., together with volume of diversions, than by means of maps.

Data Collected and Recorded.

In 1912, this Fish and Game Commission initiated the task of gathering all available data relative to streams, etc., and preparing accurate and authentic maps whereon all this data, together with all fish distribution in its proper position with reference to the locality of the actual plant. In June, 1912, I had the honor to be appointed to conduct this very important work.

The base maps for the commission are drawn in conformity with the United States land surveys. The data has been obtained from all available authentic sources, such as United States land and geological surveys, private surveys conducted by power, irrigation and railroad companies, county surveys and a few original surveys carried on by myself in person.

Acting under instructions of the commission I began work with the Truckee River system, the outlet of Lake Tahoe. This river basin is one of the best patronized trout localities in the state.

A base map of the basin was first prepared whereon was placed all streams, lakes, etc., and this was followed by the addition of all dams that could possibly be classed as stream obstructions whether they were provided with fish ladders or not. Likewise I obtained from the records of the assessors of the several counties through which the river and its tributaries flowed, the names of all owners of land bordering or adjacent to the streams and placed this data upon the map.

Getting a Corner on Fishing Streams.

This Truckee River map brought to light a peculiar condition of affairs. An enterprising company, owning all the land on both banks of the Truckee River from a point near Lake Tahoe to the town of Truckee, divided the 15-mile strip into lots of approximately two acres each and having a frontage of practically 200 feet on the river. These lots were put on the market with the understanding that each purchaser of one or more lots would own, in fee simple, the all and exclusive right to fish in that portion of the river immediately fronting his lot or lots. The publicity given section 4085½ of the Political Code, which authorizes the county boards of supervisors to condemn a public highway along certain streams for the exclusive use of fishing, had the effect of causing this company to withdraw its fishing promises.

After completing the Truckee River, I platted the McCloud River Basin. Here was found a like condition. One club and two or three individuals own or control practically thirty miles of the best fishing on the river. Even deputies of the commission have been refused permission to enter the sacred precincts of these fishing barons, and it required no little diplomacy and exchange of hard words to change their attitude. However, with the educational propaganda of the com-

mission, these people have modified their regulations very considerably in most instances. The McCloud River is widely known as the home of the rainbow trout, and its even flow throughout the driest of summer periods makes it one of the best trout streams in the state. It has a mean daily flow of 2,509 second feet of water.

After the completion of the Truckee and McCloud systems, I mapped the Sacramento River, showing the ownership of the lands adjacent and adjoining as in the case of the prior maps.

I then turned my attention toward obtaining accurate information relative to the mileage of streams and acreage of lakes, together with the mean daily flow of the streams and the approximate volume of the lakes, reservoirs, etc. Also I collected data relative to the rainfall of the state, temperature and general topographic features. California is the cellar and roof of the United States in that we have Mt. Whitney, the highest mountain in the United States proper, being 14,502 feet above the sea, and Death Valley, the lowest point on the whole American continent, being 427 feet below mean tide. Our climatic changes vary from 30 degrees below zero to 128 degrees above, Fahrenheit.

At divers times I continued the actual map drafting and have the bases completed for the Klamath, Pit, Feather (in part), Yuba, Bear, American and Smith River systems and the Lake Tahoe drainage basin. Have prepared a map showing the approximate locations of all proposed by-passes and cuts in the Sacramento Valley, together with existing and proposed reclamation districts.

Stream Mileage and Lake Acreage.

As I have already reported, the mileage of all streams in the state not intermittent in character and capable of sustaining fish life at all seasons of the year, I have set at 26,212. I have set the acreage of freshwater lakes at 862,133. This lake area would be increased were it possible to carry on an exhaustive resurvey of certain of our mountain lake regions. The earlier surveys executed by and under the authority of the United States government, are, in many instances, merely office surveys and the land purported to be surveyed never beheld a surveyor's transit. Numerous lakes are positively known to exist in localities when the official surveys show dry land. This commission has stocked with trout hundreds of these lakes and many of them exceed 160 acres in extent. This further shows the importance of having accurate data to refer to and maps whereon to record work of this character.

From the reports of the United States Geological Survey and from power and irrigation companies I have gathered considerable data relative to the flow of the streams. With respect to the volume of water carried by our streams it is pertinent to take into consideration the geologic formation peculiar to the mountain regions of northern and

south central California. The higher elevations are almost wholly lavic in character, and capable, through its porous character and possible underlying beds of tuff or tufa, of absorbing immense quantities of water. The gradual melting snows supply the millions of springs adjacent to this area with a perennial flow of water and distributes the runoff through and over a period of months. However, our "nature sponges," as this formation might well be called, can not care for and control the downpour of heavy rains such as we have in the later winter months. At that period the "sponges" are filled almost to their greatest capacity and the runoff is swelled to an enormous volume—attended by the annual floods in the lower valleys. The Sacramento River is a fair example of the river systems having a maximum flow in winter and a minimum in summer. During the flood period of January, 1907, this river was carrying under the Southern Pacific bridge at Sacramento City, 650,000 second feet of water.

In closing, I wish to say that when the proposed maps are completed the California Fish and Game Commission will have in their possession the most unique, and, at the same time, the most complete set of records covering every activity of this and former commissions on streams and stream life in use by any commission in the United States. These maps will show, in addition to natural and artificial stream data, the elevations at different points, temperatures, rain and snow fall and, in fact, many items necessary to the proper and intelligent conduct of affairs of the Fish and Game Commission.

Sacramento, California, June 30, 1914.

THE TUNA CANNING INDUSTRY OF SOUTHERN CALIFORNIA.

By N. B. Scofield, Fishery Expert.

The long-finned tuna or albacore (Thunnus alalunga).

General Description, Habits and Food.

There are several species of tuna in southern California waters, all of which may be styled game fish, but the one we have to deal with is commonly known by the name of albacore, less frequently called the long-finned tuna.

It is a thickset fish, as wide as it is deep and averages about twenty pounds in weight. In contour it has the lines of a submarine torpedo. It is built for speed and quickness in the water. Deep steel blue above and silvery beneath, with long sabre-like pectoral fins two fifths the entire length of the fish. The albacore is pelagic, a fish of the high seas and of very wide distribution in the warm seas of the world. It is found in deep clear water and rarely nearer than a mile or two of shore, or in shallower water than seventy fathoms. It is found in the Mediterranean and is abundant off the coast of Lower and southern California and in Japan. It is usually found in schools the individuals of which are not in compact masses but well scatterred. It swims rather deep in the water, but will quickly dart to the surface for sardines, anchovies, smelt or squid, which constitute its principal food. Its stomach often contains small devil fish, sculpins and rockfish, indicating that it also feeds near the bottom. The albacore which were being taken off Santa Monica Bay, California, during July, were gorged with small two-inch anchovies.

The albacore's season in southern California is, roughly, from May to December, although they may be found in small numbers during the other months of the year. When stormy weather sets in the fish almost entirely disappear, and it is the general belief that they move southward. Very little is known about the migrations or spawning habits of the albacore. The most reliable information I have obtained on the subject was given my by Mr. M. Kondo, formerly professor in the Imperial Fisheries Institute at Tokyo, and by Mr. S. F. Takasaki, an assistant from the same institution. These gentlemen have made investigations in Lower California during the last two years. On March 7, 1912, while trying for albacore near Magdalena Bay, they took twenty fish by trolling. The fish were mature and ready to spawn. The roe of the females was about the same size as codfish roe, and was a light brownish red color. Toward the end of March, this year, they again took albacore with mature roe off San Batrome (?) Bay, Lower California, and at that time observed large patches of floating eggs, which they were satisfied were

Unloading albacore (tuna) from launch at San Pedro.

Japanese unloading albacore (tuna).

either the eggs of the albacore or of the bonito. They could not be sure which they were for they also took bonito with mature roe. In both of these instances the albacore were found well off shore in deep water. At San Lucas they found albacore plentiful in January. On visiting San Lucas again in August they found them still plentiful. At this time all had spawned. Mr. Kondo believes albacore are plentiful at San Lucas the year round. They appear off Magdalena Bay in numbers in April and usually enter the bay itself in August.

It seems reasonably certain from this evidence that the albacore begins spawning in March near the latitude of San Lucas, Lower California, in deep water off shore. The eggs are buoyant and float at the surface of the water. The albacore moves northward, in the late spring, in search of food. The fish taken during the early part of the run in southern California are considerably smaller than those taken later. A reasonable explanation of this would be that the larger mature fish are occupied with the business of spawning and do not move northward as early as the immature fish. It is not likely that the albacore spawns near the Santa Barbara Islands, as some have thought, for fish with mature roe are not taken there. When the fish arrive in May or June they have very immature roe or have already spawned. Fish under eight pounds are not common, and one as small as two pounds is a rarity. The albacore's appearance here coincides with the appearance in abundance of sardines. The fishermen believe the albacore follow the sardines and other food and that there is a general movement up the coast in the spring of the year. As far as we know the albacore does not run in numbers north of the Santa Barbara Islands. Occasional individuals are taken far north of that point. One is recorded 250 miles north of San Francisco, taken on a "jig" made of a hook and seagull feathers, late in the fall of the year, by returning Alaska salmon fishermen.

The Albacore in the Mediterranean Sea.

In the countries bordering the Mediterranean on the north, the albacore is valued very highly as a food fish. It is evidently not nearly so plentiful there as here, and the fishermen fish for it with large gill nets three hundred fathoms long. They are held in such esteem there that the fishermen themselves usually can not afford to eat them, but sell them for a good price and for themselves use less expensive fish.

Those who have eaten the Mediterranean albacore consider the fish taken here its equal if not superior in quality and flavor, but until within recent years the albacore here has not played an important part in the food supply. Small quantities were salted and dried for the Portuguese and Japanese trade, but not until enterprising packers began canning it and advertising it did the people appreciate it.

Albacore (tuna) ready for the cooker.

Origin and Growth of the Tuna Canning Industry.

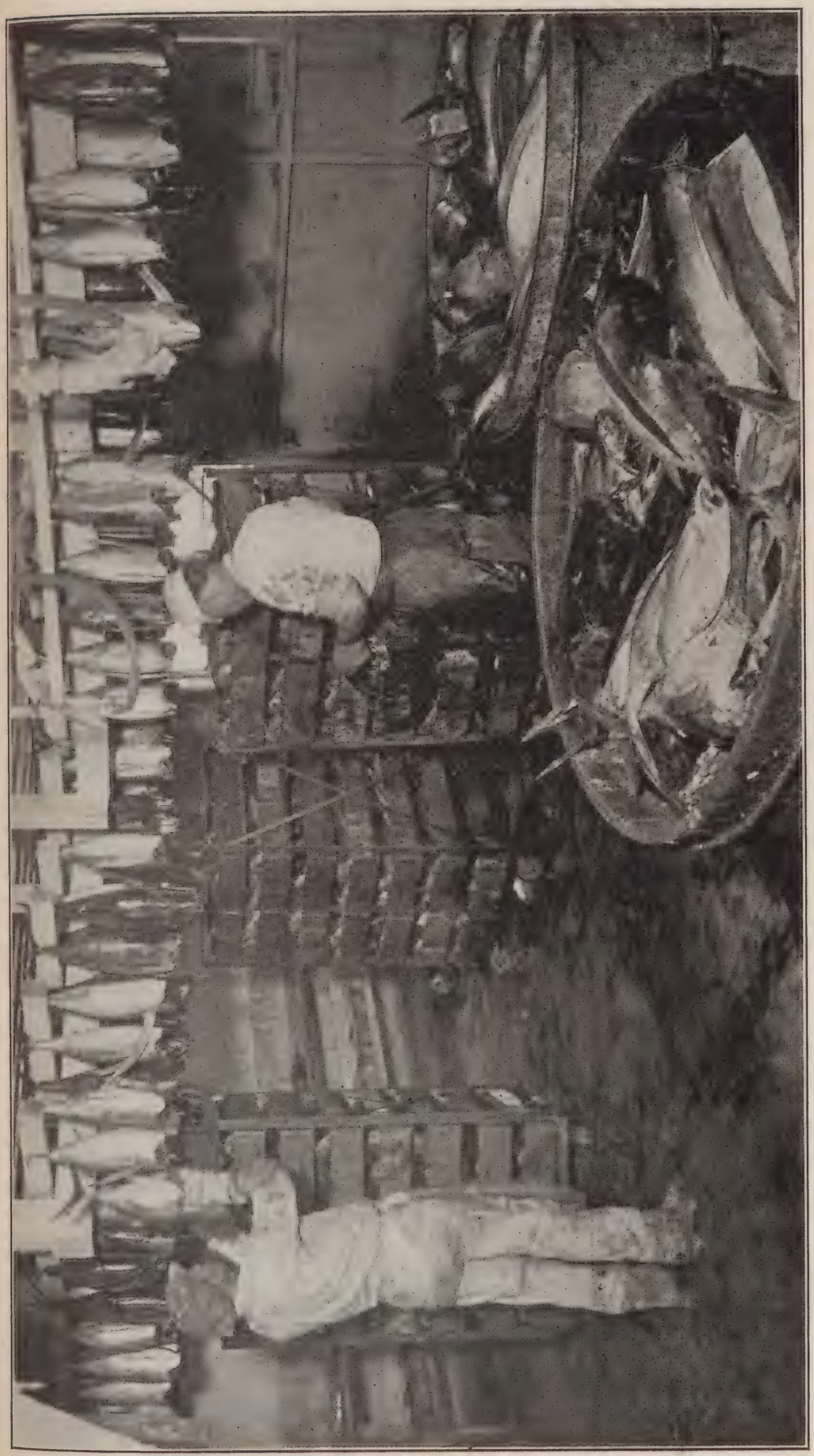
About six years ago the Southern California Fish Company of East San Pedro packed a few cases of albacore as an experiment. The first important pack was in 1911, when the above cannery and the Pacific Tuna Canning Company of San Diego together put up about 20,000 cases. From that time on the industry has grown enormously. In 1912 there were five tuna canneries in southern California which put up 80,000 cases. In 1913, there were nine canneries which put out 128,000 cases, or roughly 6,400,000 pounds. In canning, but little more than 50 per cent of the whole fish is used; so that the weight of the fish as they were taken from the sea was about 12,000,000 lbs. At this time, July, 1914, there are eleven canneries located in southern California, and at least one more in Lower California at Magdalena Bay. The canneries of southern California up to July 18th had taken 90,000 cases or, roughly, 9,000,000 pounds of the whole fish as they come from the ocean. The season so far is considered poor. The fish have not been as plentiful as it was hoped they would be. Preparations had been made to put up a large pack, for the demand for canned tuna has been great. The combined canning plants expected to put up 300,000 cases. The season is probably not half over, however, and they may yet put up very nearly this expected amount, which at the ruling prices would bring, at wholesale, over $1,500,000.

Other Uses of the Tuna.

Besides the tuna that are canned, large quantities are used in the fresh markets, and the demand for this fish in a fresh condition is very rapidly growing. It is estimated 200 tons of fresh albacore will be handled through San Diego and Los Angeles markets this year. It was reported at San Diego that an eastern order had been placed there for 300 tons of albacore to be shipped frozen. At least three companies are putting up salted and smoked albacore or tuna. One of these firms, the Redondo Fish Company, will put up 350 tons this year if they can get the fish.

Method of Taking the Albacore in Southern California.

Boats.—The boats engaged in taking albacore are good seaworthy boats of about five tons and driven by 15 to 25 horsepower gasoline engines. They are decked in and have a cabin that accommodates the three men of the crew. The average cost of these boats is $2,500. Placed on the deck and near the stern of each boat is a square tank for holding and keeping the sardines, anchovies and smelt used for bait. A pump connected with the boat's engine keeps fresh sea water constantly circulating through it to keep the bait alive. Each boat also has its own small meshed net for catching this bait. Before daylight the boats start out and run to wherever they can get sardines, which are considered the



Hanging albacore (tuna) by tails to drain.

best bait that can be used. After they have secured sufficient bait, which is very often not easy to get, they start out into the open sea for the fishing grounds, trolling behind them a couple of "jigs" or lures, which are made of bone and so fashioned that they resemble a small fish as they are drawn through the water. These "jigs" are usually homemade affairs, each boat having its own particular pattern. When an albacore seizes or "strikes" one of these lures, the boat is quickly brought to a stop, the men at the same time throwing out live bait to draw the fish around the boat. Soon they can be seen "breaking" at many places about the boat as they come to the surface after the sardines thrown out. Hand lines are then thrown over baited with the sardines, each man operating one line. If the albacore are biting well, a ton or more are caught in a very few minutes. When they cease to bite, the boat moves on, with the lures out as before, until another school is struck.

Another method of catching the albacore is by pole and line. This method was introduced by the Japanese and is called the "Jap pole" method. A short, unyielding bamboo pole is employed with a line slightly longer than the pole itself. A live sardine is hooked through the back and so held with this pole and line that it swims about on the surface of the water. The pole is supported by one hand with its butt against the body. With the other they scatter splashing drops of water around the swimming bait, with a cup shaped bamboo paddle tied at the end of a short springy piece of bamboo. This is supposed to make the one sardine look like a whole school. If the fisherman is alert he will check the albacore as soon as it seizes the bait and before it gets started down with it, and lifting it bodily from the water, swings it into the boat in one mighty heave. When the albacore are coming fast this is the favorite method of fishing, for it is much faster. With the hand lines a gaff has to be used to lift the fish into the boat.

The albacore are cleaned or dressed at sea by the fishermen. The head and entrails are removed, in which process the fish loses about 18 per cent of its weight. For the dressed fish they receive from the canneries 1½ cents per pound. Anything less than a ton of fish is considered a poor catch and catches of four to six tons are common.

The Capture of Bait.—In fishing for albacore the most difficult part is obtaining the bait. Very often the sardines or anchovies are hard to find or the fishermen may have to go a long distance out of their way to get them. Frequently some of the boats are not able to obtain bait at all. Small meshed nets of two types are used for capturing this bait. Practically all boats carry a small net known locally as the "blanket net." It was introduced by the Japanese. A few of the boats now carry circle or lampara nets, the largest of which are 350 feet long and about 40 feet deep.

Removing skin and bones from albacore (tuna).

It is necessary to use the larger nets when the sardines and anchovies are scarce. The "blanket net," I think, is a harmless net and does little or no damage. The circle net is usually cast where a school of sardines or anchovies is observed at the surface of the water, and the nets take little else. The only serious damage they could do would be when they are used in too shallow water and the lead line drags the bottom. I understand they seldom use it where the water is shallow.

No legislation should be contemplated which would hinder these nets in the taking of fish for bait, as it would seriously cripple the tuna industry. Due to the scarcity of bait at times, I think it would be to the best interest of the people as a whole in the southern part of the state to allow the restricted taking of bait within fish preserves.

The Canning of the Tuna.

Only the long-finned tuna or albacore is used in canning. The dressed fish are brought in by the boats in the afternoon or evening to the cannery wharf, where they are unloaded and hung by the tails to drain over night. The next day they are packed in wire baskets and cooked with steam in large retorts. They are rolled on trucks from the retorts to the cooling room, where they remain until cooled. They are then carried to the tables, where women and girls remove the skin, bones and dark meat. Only the white meat goes into the cans. The rest of the process is very similar to the canning of salmon or other fish. The latest canning machinery and equipment is the rule in the tuna canneries. The plants are new and most of them have started out with the best.

There are now eleven of these canneries in southern California, located at San Pedro, Wilmington, Long Beach and San Diego. They have approximately $300,000 invested in buildings and their equipment. Besides this there are the boats, about 125 of them, worth at least $300,000 more.

Following is a list of the canneries with their estimated capacity:

Van Camp Sea Food Company, San Pedro.
Formerly the California Tunny Canning Company. They can handle 35 tons of dressed fish daily; put up the "Van Camp's" Brand.

White Star Canning Company, East San Pedro.
Capacity, 15 tons daily; put up the "White Star" Brand.

Southern California Fish Company, East San Pedro.
Capacity, 15 tons daily; put up the "Blue Sea" Brand.

United States Fish Packing Company, Wilmington.
Capacity, 5 tons daily.

United Tuna Company, Wilmington.
Capacity, 25 tons.

Monarch Canning Company, Wilmington.
Capacity 8 tons daily; put up the "De Lux" Brand.

Los Angeles Tuna Canning Company, Long Beach.
Capacity, 15 tons; put up the "Panama" Brand.

South Coast Canning Company, Long Beach.
Capacity, 35 tons; put up the "Avalon" Brand.

Canning albacore (tuna) at San Pedro.

Lower California Canning Company, San Diego.
Occupies the site of the former Roberts-Hume Fisheries Company; capacity, 20 tons.
Pacific Tuna Canning Company, San Diego.
Capacity, 20 tons; put up the "Catalina" Brand.
Premier Packing Company, San Diego.
Capacity, 15 tons; put up the "Premium" Brand.

Of these canneries the Southern California Fish Company has canned sardines for several years. At least three others, the Lower California Canning Company, San Diego, the South Coast Canning Company, Long Beach, and the Van Camp Sea Food Company, San Pedro, will can sardines this winter. The rest of the canneries are likely to soon be canning other varieties of fish, rather than allow their plants to be idle the five or six months between tuna runs. These canneries will greatly expand the fishing industry of southern California. Improved methods of fishing will undoubtedly be introduced. The taking of albacore with hook and line is rather a primitive method, but still very effective while the fish are numerous. Occasionally, though, the fish do not bite, although they may be there in large numbers. So far, no net has been successfully used in these waters for the taking of albacore.

As to the probable effect of intensive fishing for albacore, it is not likely that intensive albacore fishing in California waters will ever greatly reduce the numbers of these fish. The spawning fish are not taken in California, neither are the young; nor is it at all likely that all the albacore migrate into California waters between spawning seasons. Any laws looking toward the preservation of these fish would have to apply to Mexican waters, where the fish spawn and the young are to be found. Intensive fishing near San Lucas, where they spawn and are found throughout the year, would undoubtedly affect the California fisheries seriously.

The Utilization of Fish Waste.

When the albacore are caught at sea, they are at once cleaned, and 18 per cent of the fish is thrown away and is a total loss. The dressed fish, before it is in the cans, loses a third or more of its weight. This one third of the cooked fish is at the present time turned over to "fertilizer" plants which pay from 75 cents to $1 a ton for it. They convert it into chicken feed and sell it for about $50 a ton. Some of the canneries expect to put in plants of their own to take care of this waste. The Lower California Canning Company will put in a plant to convert this waste into chicken feed. They expect to make a well balanced chicken food of it by the addition of ground red abalone shells. Other canneries expect to can their cooked "scraps" for chicken feed. It probably will not be long until they will be using the heads and entrails, now thrown away at sea, for fertilizer. It is proposed to use kelp fertilizer, which is rich in potash, with fish waste, which is rich in phosphoric acid and nitrates, thus making a well balanced fertilizer.

FISH AND GAME CONDITIONS IN THE "LAND OF LITTLE RAIN."

By E. H. Ober, Assistant Commissioner.

Inyo County has an area of 10,294 square miles; its boundaries are, north, Mono County; east, the Nevada state line; south, Kern and San Bernardino counties; west, Fresno and Tulare counties; its surface is largely mountainous, interspersed with large valleys, of which the Owens Valley is the largest, being over one hundred miles long and about seventeen miles wide at Bishop City, and varying in width as one goes south from four to ten miles. The Sierras here being impassable by wagon, the valley is reached from the north or south only, from California points, with the exception of four fair packtrails which lead across the Sierras.

The altitude of Owens Valley ranges from 3,620 feet at Keeler, the southern point, to 4,148 feet at Bishop, in the north; Mount Whitney, the highest peak in the United States, is within Inyo's borders, and many slightly less high neighboring summits afford scenic views scarcely less grand. We also have Death Valley, one of the lowest depressions in the world, at one point 430 feet below sea level. On each side of this wonderful Death Valley mountains rise to an altitude of from 8,000 to 10,000 feet, and within its bleak wastes desolation reigns supreme; a temperature of 120 degrees, and even higher, is not rare here. Naturally, in view of the foregoing facts, there is a tremendous amount of misunderstanding concerning this region, people generally accepting the sole functions of the valley as that of Creation's morgue; but it may be truthfully said that almost in its very heart springs of pure cold water are to be found, small tracts of land are now under cultivation, and more are sure to become so in the years to come. Similar conditions exist in the desolate valleys of Pannamint, Saline, Cow Horn and Eureka, these being continuations of Death Valley, lying to the north and west, and all being located in Inyo County.

Writers of note have frequently referred to Inyo County as a "sportsman's paradise," and that the Sierra Nevadas, particularly their frontage west of the Owens Valley, are, from a scenic standpoint, unsurpassed by any portion of the globe.

Mountain sheep are very plentiful in Inyo County, especially in the southeastern portion where the Nelson or desert sheep makes his home; their increase within the past five years has been truly wonderful, due to the fact that each year has brought forth an abundance of rain, with its consequence of plenteous feed in the particular habitat where these sheep abound, and to the further fact that very little if any mineral prospecting has been done, which certainly acts as a disturbance and cause of much loss of life to the sheep.

That which is, perhaps, the largest herd of mountain sheep in Inyo County, may be found around and near Homestake Canyon, on the eastern slope of the White Mountains about twenty miles east of Independence. This herd numbers upward of one hundred and fifty head, but they have been observed, however, in separate bunches, eventually reuniting. Homestake Canyon is their watering place during the summer months.

East of Homestake Canyon, and across Saline Valley twenty miles to Hot Springs, and around Sand Springs and Last Chance Mountain, mountain sheep may be found everywhere; also on Ubehebe Mountain,

Mount Tom in Inyo County. The home of 100 "bighorns" (mountain sheep).

lying east of Saline Valley, mountain sheep are very abundant, and south of Ubehebe Mountain for one hundred miles; all through the Funeral, Argus, Pannamint and Slate ranges of mountains, they abound. They are most numerous, however, in Inyo County, in the above named mountains, and in and around "Windgate Pass" and the Sheep Mountain country, and on the western slope of Tin Mountain northeast of Ubehebe Mountain.

Directly east of Big Pine, about thirty miles, there is a very beautiful herd, the writer, on several occasions having seen as many as sixty at one time, and thirty-eight and forty at others; very reliable reports reach me concerning their splendid increase each year.

The Nelson or desert sheep vary in color at different seasons, ranging from a pale gray in summer to a pale blue in winter. Desert sheep frequent the most remote and precipitous and barren mountains imaginable, using for their shade and resting place the faces of perpen-

dicular cliffs. Their food consists chiefly of the tender shoots of growing brush and their favorite dessert is the most delicate ferns and flowers.

In the Sierras running through Inyo County there are three herds of mountain sheep, and these are a distinct and much larger variety than the desert sheep. People generally are not aware of the existence of these sheep from the fact that tourists seldom see them, as they are found high up in cloudland and above the localities frequented by man. The largest herd known in the Sierras can be found northeast of Independence and about ten miles away; the writer has observed this herd upon many occasions, and their number is in the near neighborhood of eighty-five to ninety, sixty-five having been counted at one time this last winter at the base of the mountains touching the valley, and within a stone's throw of an automobile road, thus refuting the popular notion that mountain sheep do not change their altitude, regardless of weather conditions.

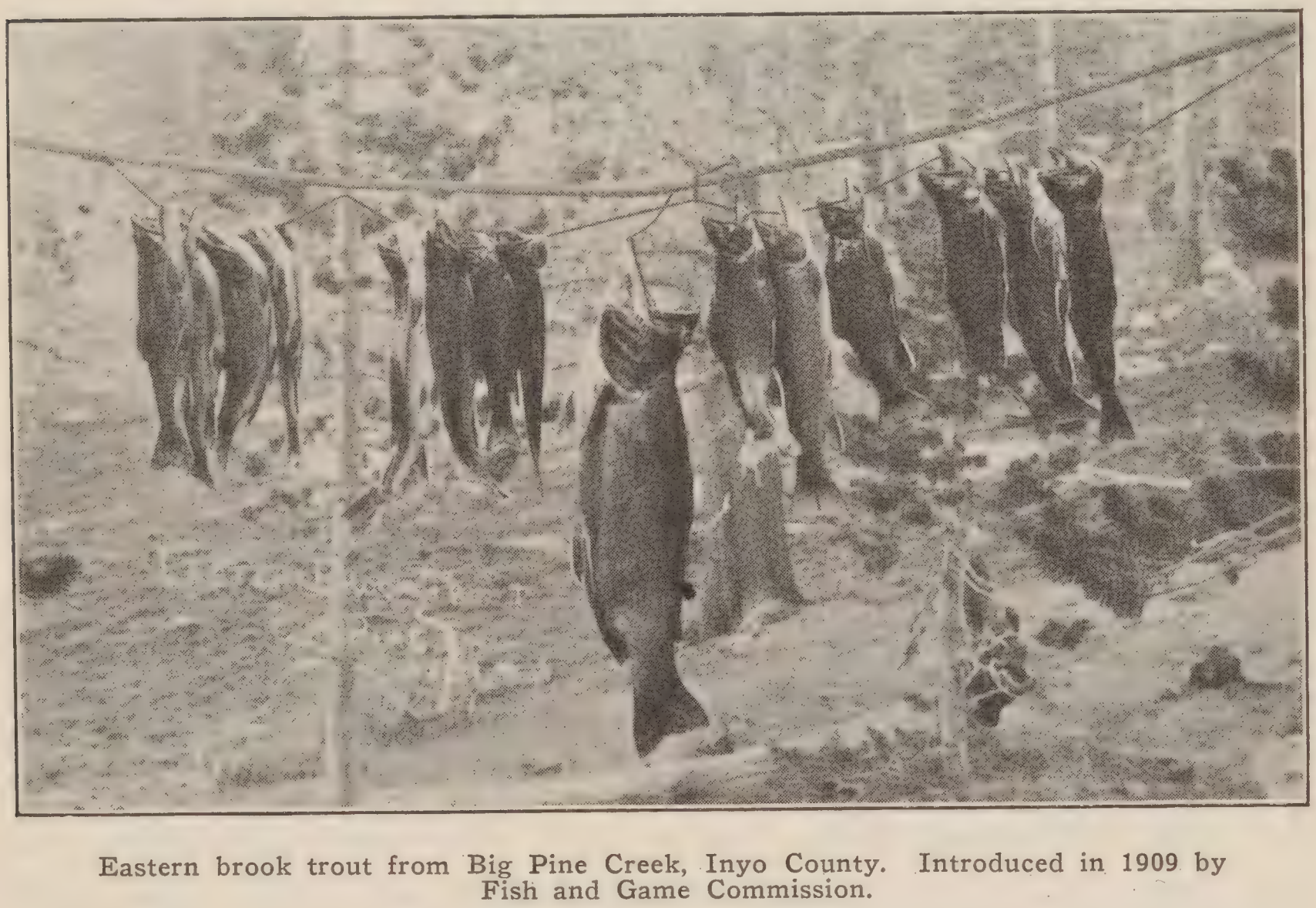
The herd next in size may be found about twenty-five miles west of Bishop City, on Mount Tom, and numbers about forty or fifty head; they follow the snow line in winter, and, as a matter of fact come very close to the little farming community of Round Valley.

The next largest herd make their home in the neighborhood of the South Fork of Big Pine Creek, and from there on over to the rough Birch Creek and Mount Credo country; this herd consisted of about thirty head when last seen by the writer.

Of all the game animals in California the mountain sheep stand in a class by themselves; nature has provided for their welfare in many ways, having provided them with a telescopic vision and a telephonic hearing. While bold and seemingly reckless in their rock and cliff climbing, they are quick to calculate, always on the alert, and their judgment is free from error; they are very robust and strong limbed, yet very active withal, and are capable of feats of great endurance and in many ways most astonishing. Notwithstanding what many people have written and said, a mountain sheep can not and never did leap from any great height and alight upon its horns. The fact that the desert sheep are rarely found with unbroken horns is due to their using them in seasons of drouth, for prying amid the rocks and boulders in search of a certain succulent and watery bulb, called by the Indians "Sequaya," and which serves the sheep as a thirst-quencher until the springs are replenished and flow again; while in the Sierras, on the other hand, where water is plentiful, the horns are nearly always perfect to the very tips. When sheep are once pursued or fired upon, however, they can dash down an appalling declivity, touching a crevice here and there, and land in perfect safety and condition, where to the observer it would seem certain to be killed. For one to fully and really appreciate mountain sheep,

they should be seen in their native home amid the grandeur of the treeless slopes, far above timber line, in the Inyo section of the grand old Sierra Nevadas.

The people of this county are duly grateful and appreciative of the splendid results achieved for them through the efforts of the State Fish and Game Commission. There is not a living stream within its borders today that does not teem with either rainbow, Eastern brook, cutthroat, Loch Leven or golden trout; at least fifty mountain lakes, previously barren of life, now hold countless millions of large Loch Leven and Eastern brook trout, and the bagging of a five-pounder of either of



Eastern brook trout from Big Pine Creek, Inyo County. Introduced in 1909 by Fish and Game Commission.

these high class table varieties has long since ceased to be rare enough to cause a comment, and is commonplace. The commission has well stocked seven streams in this county with trout, streams to which the fin of a fish was previously unknown, and has added to this section an asset in the way of an attraction to outside people, and in actual food value, beyond the possibility of computation or of estimation. The Chinese or ringneck pheasant, introduced into this section by the commission. has also adapted himself to his new environment and is thriving and multiplying rapidly. Inyo County doffs its hat to the California State Board of Fish and Game Commissioners!

CONTRIBUTED ARTICLES.

ARID CALIFORNIA AND ITS ANIMAL LIFE.

By Frank Stephens.

Perhaps it may seem a little severe to term southeastern California arid, but the most distinctive character of the region I wish to indicate by this heading is its dryness as compared with the region west of the mountains. I am writing of that part of southern California east of the Sierra Nevadas and the mountains south to the state line. While a large part of this region is arid, there are localities of greater or less extent scattered through it that are less arid, either from the presence of streams or springs that furnish water for irrigation, or from a higher altitude causing a moister mountain climate. Animal life is more abundant and of greater variety in these less arid localities, but there is some life in all parts of this region. A greater proportion of it is nocturnal than in the western part of the state, and animals of nocturnal habits are more likely to be overlooked than those that are abroad in the daytime. This is the principal reason why so many people think that there is almost no animal life on the deserts. Really one does not see much life in traveling through this region, yet there is a far greater amount and variety there than a casual observer would think possible.

In a general way the southern part of this region is known as the Colorado Desert. It is the lowest in altitude, the warmest, and averages the dryest; but it also contains the largest body of cultivated land, principally under the Imperial Canal.

North of the Colorado Desert is the Mohave Desert, a plain of higher altitude interspersed with low mountains, usually isolated or standing in small irregular groups. Some of the northernmost of these mountains rise to a considerable height and carry small coniferous forests. A more or less connected range of low barren mountains divides the Mojave Desert from the Colorado Desert.

In the strict sense of being a land without animal or vegetable life, these are not deserts, as there is everywhere some animal life, and shrubs and cactuses occur, albeit sparsely in places. But in the sense used by us "old desert rats" (as the prospectors, cattlemen, frontiersmen and naturalists frequenting this region are often called) a "desert" means a land where springs and water holes are many miles apart and grass or other horse feed is very scanty or altogether lacking.

All animal life is dependent on vegetable life, hence when plants are few animal life is correspondingly scanty. But the plants of this region sprout their seeds quickly, grow rapidly and mature early when showers

do come, and showers are quite likely to be heavy though brief. Then many annuals quickly appear that soon ripen a quantity of seeds that furnish food for many small mammals and some birds. If the rains happen to come at short intervals and extend over several weeks, the "desert" becomes a brilliant flower garden. Then the desert is a paradise for botanists, entomologists and other naturalists. Plants and insects of many species appear, live a brief life and disappear, for years perhaps. This fullness of bloom happens but rarely, however. I have seen it at its best but twice in many years.

MAMMALS.

Deer are found only near the border of arid California, the deserts being unsuited to their wants. Formerly some burro deer lived along the Colorado River, but the settlers and prospectors have practically exterminated them there. A few California mule deer range down the eastern slopes of the mountains bordering the western side of the deserts.

I do not think that antelope were ever plentiful in this region, but I once saw four antelope where Carrizo Creek opens out to the Colorado Desert, and I have seen fresh tracks of antelope many times in the southern part of this desert. As near as I can learn no antelope has been seen in that part of the Colorado Desert north of the Mexican boundary for seven or eight years. I am told that a few still survive near Lake Maquata in northeastern Lower California, and an occasional individual might wander north as far as the boundary. A small band of antelope still live in Antelope Valley, which is the western end of the Mojave Desert. This band is carefully protected, and is the only one I know of in southern California.

Bighorns (mountain sheep) still live in eastern California. The subspecies of the desert mountains is the Nelson bighorn, *Ovis canadensis nelsoni.* Recently (1912) Dr. Joseph Grinnell described a new race from the Sierra Nevadas as the Sierra Nevada bighorn, *Ovis canadensis sierræ.* It is probable that the few bighorns living in the San Gabriel and San Bernardino Mountains belong to the latter race, as Nelson bighorns prefer a warmer climate, being seldom found as high as 4,000 feet above sea level, while the Sierra Nevada bighorns live mostly above 8,000 feet altitude.

Among the rough and almost inaccessible canyons and spurs of the eastern slope of the coast range of mountains in San Diego and Riverside counties, and in the desert hills and low mountains of eastern Riverside, San Bernardino, Inyo and Imperial counties, Nelson bighorns occur in small bands or singly. There are few large bands left. Those remaining maintain a precarious existence by constant watchfulness. Their natural enemies aside from man are few. Cougars (mountain

lions), that are so destructive to bighorn lambs in the Rocky Mountains, do not occur at all in most of this region, and are very rare along the Colorado River and on the eastern slope of the coast range. Nor do golden eagles do much harm to the lambs. Coyotes kill an occasional lamb or an isolated wounded adult, but adult bighorns, especially if in a small band, are able to fight coyotes away. But bighorns can not cope with man. Sportsmen do not now kill many bighorns, but prospectors, ranchmen and Indians do kill many, in season and out of season, male

A "desert rat." (Photo by courtesy of Mr. Frank Stevens.)

and female. Most prospectors contend that they have the moral right to kill game for food whenever they have the opportunity. Travelers and outlying ranchmen pick them off occasionally; Mojave and other Indians kill some. Among them they make life exceedingly hazardous for bighorns. The frontier people particularly resent entire restriction of hunting. I believe that if a brief open season was allowed the closed season would be better respected, no more bighorns would be killed than now, and it would be much easier to educate the people to respect the closed season. With all this destruction, I believe that bighorns are nearly holding their own, and if poaching was stopped their numbers would begin to increase slowly. There is a large area of rough hills

and low mountains in southeastern California that is well adapted to the wants of bighorns, that can never be utilized for agricultural purposes for lack of water. Its principal value at present is as a prospecting ground for minerals. By thorough protection the number of bighorns in this region could be steadily increased, and ultimately this could be made a fine hunting ground.

The food of bighorns is of a coarse nature, mostly the leaves and twigs of shrubs, or a very coarse kind of desert grass called *gietta*. Bighorns go to water nearly every day in warm weather; but if disturbed at the springs, or if they become suspicious of the presence of men at the springs they may go without water for several days. At such times they eat the large cactuses that grow in this region. The Indians tell me that they sometimes get in the habit of eating these cactuses and then go without drinking for a long time in cool weather.

Six species of squirrels live in arid California, all being ground squirrels or chipmunks. Some of these squirrels are troublesome to farmers through depredations on crops. No tree squirrels or flying squirrels live in this region as there are no extensive forests.

Formerly beavers were common along the Colorado River, but they have been trapped so relentlessly that they have become quite scarce. If they were thoroughly protected a few years they would again become common. Notwithstanding the warm climate in which they live the fur of these beavers is fairly good because the water of the river remains cool most of the year.

Muskrats occur here and there along the Colorado River, but are not common. I am told that they have followed down the Imperial Canal and have become quite troublesome by causing breaks in the canal. They are likely to always be troublesome in such canals as it is not practicable to entirely exterminate them. Their fur is poor.

Mice and rats, of many species, are the most abundant mammals of arid California. A locality must be barren indeed if mice are unable to find food in it, and the mice of this region are hardy. In favorable places they become very abundant, particularly pocket mice and pocket rats, which have developed the habit of storing food in the season when it is most abundant. The list of species of these two groups foots up thirty for arid California. Of course no one locality has half of them.

Desert jack rabbits are widely distributed, though sparsely in the more barren parts. Arizona cottontails are common in the Colorado River bottoms, and in various places where brush is plentiful enough to make sufficient cover. They are lacking in wide areas of the more barren parts of the region.

Desert wildcats (lynx, bobcats) are found along the Colorado River and along the old channels running from it into Salton Lake, and less commonly in brushy localities in the foothills and low mountains. They prey on rats, mice, cottontails, etc., and once in a while on poultry.

Yuma cougars (puma, mountain lion) are rare inhabitants of the Colorado River bottoms, not occurring west, according to our present knowledge of their distribution. The Pacific cougar occurs in the foothills bordering the deserts on the west, but is becoming quite rare. They prey on squirrels, rats, mice, rabbits, and occasionally on hogs, fawns and bighorn lambs.

Coyotes are common everywhere in arid California. They prey on cottontails, jack rabbits, ground squirrels, rats and mice, and such insect life as grasshoppers and beetles. They catch a small amount of poultry at isolated ranches and the borders of settlements, but on the whole they do the farmer more good than harm, as they help keep in check harmful insects, ground squirrels, gophers, etc. Certainly no bounty should be paid for the destruction of coyotes.

Foxes of two species live in this region. The desert kit fox is a yellowish colored animal inhabiting the open desert. Its prey is almost entirely rats and mice. The Arizona gray fox is common in the timbered bottom lands along the Colorado River. They are easily trapped.

Raccoons are abundant along the Colorado River and the old overflow channels in Imperial Valley. They eat fish, frogs, rats, mice, fruits and seeds. Their fur is moderately good in winter.

A very few badgers are scattered through arid California.

Sonora otters are rare along the Colorado River. Trappers look closely for their signs and occasionally get an otter there.

Arizona skunks are common along the Colorado River and the old channels. A few spotted skunks live in the same region.

Bats are more or less common in their season in arid California, and are abundant at times around water.

Altogether about sixty-five kinds of mammals are native to arid California.

BIRDS.

About two hundred species and sub-species of birds are known to be found in arid California at some season of the year. About thirty-five of these are practically resident all the year. Most of the water birds are present only in winter. Over a large part of this area water birds are necessarily lacking, yet even small ponds and springs are visited by migrating ducks at times. The muddy waters of the Colorado River are not inviting to water birds, but the sloughs and ponds

of the flood channels of the lower river afford clearer water, and are visited by great numbers of water birds in winter, more particularly those in Lower California, where the birds are not harassed by hunters so much.

Sea birds of course do not visit this part of California, and loons, grebes and gulls are not common. White pelicans sometimes appear in large numbers in winter. I have seen flocks covering several acres standing thickly on sand bars a few miles south of the boundary. A dozen species of edible ducks occur. They are most common south of the boundary, but a considerable number are to be found along the overflow channels and on the main river in California. Geese are of irregular occurrence in this region and are seldom abundant.

Wood ibises come up the Colorado River in summer after their breeding season along the Gulf of California is over. I have seen large flocks in August a hundred miles above Yuma. These large birds are not used as food. I do not know that they do any harm, unless possibly by eating the young of edible fishes. They appear to glean their food entirely from the water. Herons of several species are found, but rarely away from the big river or its overflow channels. Shore birds are comparatively few, for lack of suitable feeding grounds.

Three species of quail are found in arid California. California valley quail are limited to the foothills along the western border of the deserts, and the partly timbered mountains of the northern Mojave Desert. In some of these mountains nice coveys used to be found at some of the springs. Mountain quail also occur at many of the same places in smaller numbers. I have even found mountain quail in thin growths of juniper. They seem more independent of water than valley quail. Gambel quail are often abundant along the Colorado River and about the overflow channels, though their numbers are now being greatly lessened around the settlements by steady hunting. The ranges of these three species meet at the western end of the Colorado Desert. I have shot hybrids between valley and Gambel quail there, and I have seen hybrids between mountain and Gambel quail that were shot on the northeast slope of the San Bernardino Mountains.

Mourning doves are found occasionally in summer at springs and water holes, and more commonly along the Colorado River.

Hawks are usually scarce throughout this region, as are owls, though great horned owls are somewhat more common where they can find shelter in crevices in cliffs.

Woodpeckers are scarce away from the mountains and the timbered river bottoms, and are not very plentiful even there.

In certain places hummingbirds are common when flowers are in bloom. Four or five species occur, though two are only migrants.

Flycatchers are not common, for lack of insect food. The male of one species, the vermillion flycatcher, is conspicuous from its bright red colors.

Ravens are widely distributed in arid California. They are usually seen in pairs, and probably remain paired permanently. When it is time for travelers to break camp in the morning and move on, a pair of ravens are likely to appear and perch on some shrub near, to wait patiently until the travelers have gone, when they thoroughly glean any scraps of food or grain that the party may have left around the recent camp. Jays are unknown in most of this region.

Blackbirds, orioles and meadow larks are ordinarily found only along the river bottoms and around the irrigated land.

About twenty-five kinds of sparrows are found in this region, mostly as migrants or winter visitors. Swallows are common in but few places. The smaller insectivorous birds are mostly only transient migrants.

Wrens are few, the cactus wren being the most conspicuous species. Crissal thrashers are common in the thickets of the river bottoms, and the rare LeConte thrasher is sometimes seen out in the desert, where it is a permanent resident.

On the whole, birds are not plentiful, as might be expected in so barren a country.

FISH.

Fish of course are scarce in a region so deficient in streams as this is. As a matter of fact no edible fish are found in arid California except in the Colorado River and in the sloughs and ponds supplied by it. Even in the Colorado River native fish are not abundant, as the water is so muddy as to make it unfit to support most kinds of fish. There are some carp and catfish, the descendants of introduced fish. There are very small fish, like small minnows, in many of the permanent springs of arid California, particularly in the warm springs. These little fish are of several species, and sometimes two or three species live in the same spring. It is a problem how these little fish became so widely disseminated in isolated springs.

SNAKES.

Snakes are not abundant in arid California. Perhaps rattlesnakes are the most common species, though they are not nearly as common as when I first knew the desert, nearly forty years ago. Every one kills rattlesnakes wherever found, and this steady destruction has decidedly lessened their number. The small rattlesnake known as the "sidewinder" is peculiar in its mode of locomotion. It moves side-

wise or diagonally to the direction which it faces. It is dreaded by the "desert rats" because it gives so little warning; its rattle is small and is little used, while the larger species sound their rattle on slight provocation. Several other species of snakes live in this region.

LIZARDS.

Lizards are comparatively abundant, both in species and in individuals. Several prospectors and cattlemen have told me that they had seen the big lizard known as the "Gila monster" in southeastern

The border of the desert. (Photo by courtesy of Mr. Frank Stevens.)

California. A little questioning usually convinced me that the lizard really seen was the "chuckwalla," another large lizard that is rather common in rocky places in the Mojave Desert, and is occasionally found in the foothills bordering the Colorado Desert. I know of no reliable record of the occurrence of the Gila monster anywhere in California. It is the only poisonous lizard found in the United States. The desert Indians formerly ate chuckwallas and other large lizards, and to some extent do so yet. White men laughed at them for eating lizards and rats, and now they do not like to be seen eating such things, although they are really as clean and wholesome as squirrels and rabbits.

TORTOISES.

Agassiz tortoises inhabit arid California. They are found most often on the mesas west of the Colorado River, but I have never seen them plentiful even there, and farther west they are rare. The Indians eat them, and so do the white settlers sometimes. I have seen teeth marks of coyotes on their shells, but the shells generally prove too hard for the coyotes. These tortoises are exclusively vegetarian. They are able to become dormant for weeks at a time when green food is scarce, and in cold weather. They are principally nocturnal, in hot weather at least.

THE CALIFORNIA FISH INDUSTRY FROM A COMMERCIAL POINT OF VIEW.

By F. E. Booth, Secretary, Sacramento River Packers' Association and President, Monterey Packing Company.

Much has been said in the press of the state about a so-called "fish trust," which has, it is stated, arbitrarily raised the price of fish to the housewives, until fish is a higher priced article of food than the choicest beef cut.

Thousands of our good citizens have really believed this, and some are even satisfied that this charge has been fully proven. They recall the time when shrimps and cracked crabs were served free, as an appetizer, at many of the old-time restaurants; when a whole cooked crab could be bought for 10 cents; when salmon were so plentiful on the Sacramento River that the steamboats refused to haul them from river receiving points to San Francisco, unless the freight charges were prepaid. They can remember visiting the beach at old Harbor View and watching the always picturesque fishermen, hauling in their beach seines, and usually with a mass of all kinds of good food fish, including many dozens of crabs, at each haul. Fish were so plentiful then that any one could help himself, without objection from the fishermen.

Now all this is changed, and the old-timers, without trying to find the real cause, accept without question, or the slightest investigation, the first explanation that any irresponsible person may make. Hence, the cry of "fish trust" was taken up and believed, and is, unfortunately, still believed by many to be the cause of high prices.

The purpose of this article is to put the commercial fishing business right up to the reader, and let him draw his own conclusions.

Any person, after a moment's thought, will admit the following to be true, almost from his personal knowledge of the situation. First, that if he eats fish at all, it is almost always on Friday, and at no other time; second, that he eats fish not so much for its food value as for a change in diet, or because of church edicts.

Statistics show that 80 per cent of the fish business is done on Friday, and 15 per cent on Wednesday (both days being observed by certain religious denominations, as fish days), the remaining 5 per cent being scattered over the other four business days in the week.

It requires no great knowledge of arithmetic to figure out a tremendous additional increase in the cost of fish from this very fact. A retail fish dealer must, therefore, get practically all his week's expenses and profits from his Friday sales. This necessarily means 50 to 100 per cent added to his cost.

Another thing, which is altogether wrong, is that most of the retail fish business is carried on by persons selling practically nothing but fish, and it is imperative that they get these higher prices to make even ordinary wages. The economical course would be for butchers or grocers to be the distributors of fish, for their expenses would be no greater than when handling meats or groceries. Some butchers do sell fish, and they could *afford* to sell, for at least one half of their asking price. But why should they, they argue? Their neighbor (the exclusive fish store) gets from 20 cents to 25 cents per pound for fish, so why shouldn't the butcher? Not a bad argument, and one you would probably use.

Once more they argue, a woman will only buy 50 cents to 60 cents worth of fish per week, anyway, and she doesn't care what it costs per pound. Still once again, the housewife phones her fishman, and nine times out of ten wants that variety of fish which she can prepare with the least trouble and which has the least waste in bone or skin. So she orders halibut or salmon, or striped bass.

A thoughtful reader will see right here one of the reasons for advanced prices to the retailer.

The population of the cities throughout the state has doubled and quadrupled within a comparatively few years. This has directly increased the demand for fish, and certain kinds, notably salmon, have not increased with the population. In fact, as population has increased and encroached on the spawning grounds of the salmon, it has automatically lessened the natural increase of the salmon. Had it not been for the artificial propagation of salmon in all these last twenty-five years, it is reasonable to suppose there would not now be a single salmon left in the Sacramento River. As it is, the supply is tremendously bigger than most people think, for the increased consumption in the fresh fish market requires an enormous supply of salmon. The fall run of salmon is probably as big now as it used to be, although it is not so apparent owing to the enormous demand.

Striped Bass.

One of the most popular of all the river fish, the striped bass, was originally introduced by the Fish and Game Commission from the waters of the eastern part of the United States. Evidently it liked the new surroundings, for its increase has been marked. The present laws regarding the catching and sale of this fine fish seem most wise and effective. This fish is usually high priced, as it is a fine shipping fish, firm and a good carrier, and justly popular. It matures in salt water, returning each year to fresh water for spawning purposes, after which it again returns to salt water.

Shad.

This is another transplanted eastern fish, which, like the striped bass, has increased rapidly in the Pacific waters. But there the comparison ends, for the fish has not met with popular favor. It is esteemed most highly in the eastern markets, the wholesale price running from 8 to 10 cents per pound. It is admitted that the Pacific fish is in every way as fine as the Atlantic variety, but people here will not eat it, even at a retail price of 5 cents per pound, cleaned and delivered to the house. Their principal use now is to strip them of the roe and salt the rest of the fish. It is hard work to sell them salted at $1\frac{1}{2}$ cents per pound, dressed, dried weight, boxed and delivered, f. o. b. to the China steamers. The Chinese exporters are practically the only ones handling the salt fish.

Catfish.

Here, again, is an example of what success the Fish and Game Com mission has made of an imported fish. The catfish is entirely a fresh water fish, and has found a home to its liking in the California waters. For several years it was a despised little fish, too plentiful to be considered good for anything, and neglected accordingly. Gradually, however, its worth became known and it came into its own. Over fishing necessitated special laws regarding size to be taken, kind of nets to be used, etc.

Crabs.

This dainty sea food has before been mentioned in this article. Twenty-five years ago, these fish were sold for from 40 cents to 50 cents per dozen. Now they command from $2 to $2.50 and even $3 per dozen. This advance is occasioned by two factors: *First,* an extraordinary demand owing to a large population; *second,* to a combination among the crab fishermen's union, which imposes a limit on the number of crabs that can be taken in one day, and the price they must be sold for.

Shrimps.

The bay is said to be as full of shrimps now as it ever was, yet comparatively few are being caught. Here is the reason: There is only one "best" way of catching shrimps, at least only one "best" *known* way, and that is with a Chinese shrimp or bag net. This is so constructed that it not only catches shrimps of all sizes, but everything else that is alive that comes its way. It is an accepted theory that the young and immature fish of most every variety of salt water fish live right in among the shrimps. This is most unfortunate, for the taking of shrimps is very desirable. The destruction of countless millions of baby food fish is, however, not to be tolerated. After years of fighting the Chinese shrimp

interests, the Fish and Game Commission finally got a law passed prohibiting the use of the Chinese shrimp net, and this has automatically stopped shrimp fishing, since no one seems to have found out how to take shrimps with any other kind of net. This will be discovered some day, however.

As a matter of fact, not over 5 per cent of the shrimps formerly caught were used in the local market, the balance being dried and shipped out of the country. A careful account kept of one week's catch of the baby fish showed 100 tons to have been wasted by the destruction of these fish in the shrimp nets, equal, perhaps to 1,000 tons at maturity. The Fish and Game Commission never did a better thing in its career than to get the present law passed. Of course, great effort will be made to have this law repealed.

Crawfish or California Lobster.

Many people think this fish fully as fine as the eastern lobster. Certainly it is worth preserving, and it has taken endless patience and tact to have the present laws passed. The people do not care to eat the large sized crawfish, and as this is the real breeder, it was made illegal to take them over $13\frac{1}{2}$ inches long. This is as it should be. A 14 inch female lobster produces about ten times as many eggs as a 7 inch female. The present law permits the importation into California of the Mexican lobster, under the supervision of the Fish and Game Commission. This is as it should be, for it not only gives our people the privilege of having lobster, but it also protects California's supply. It is true that some of the California lobster fishermen are trying hard to have the law changed so as to exclude the Mexican fish, claiming that if no Mexican or Lower California lobsters came in the price of the California lobsters would double.

Soles, Sand-dabs, and Flounders.

These are the principal supply of fish in the San Francisco and Bay cities markets. They are caught almost entirely by trawlers, fishing outside the Heads, and frequently twenty-five miles off shore. They are the freshest of all fish sold on the market, for the trawl boats go out every day except Saturday, returning the same night. Furthermore, they are, with two exceptions, shad and carp, the cheapest of all the fish sold in San Francisco. They seldom bring more than 3 to 4 cents per pound; so when the retailer sells you this variety of fish at from 20 to 25 cents per pound, you may know he seldom paid more than 4 cents for it.

The Italian name of the net used in this trawl fishing is *paranzella*. It sounds pretty forbidding, but is nothing more nor less than a drag net, weighted to go nearly to the bottom and in very deep water, and is dragged usually between two power boats. This kind of fishing has been going on here for over forty years, with no apparent diminution of fish.

Halibut.

A large flat fish like a sole or flounder, but frequently weighing over 100 pounds. It is caught principally in Alaska, where it is cleaned and iced and shipped to San Francisco, where it finally finds a market from two to four weeks after it is caught. It has no particular merit, except an absence of bones, and is therefore easily served and popular with the "hurry up" housekeeper.

Chicken Halibut.

A small size edition of the halibut of Alaska, but caught in southern California waters. It is sold the day after it is caught. In Los Angeles they prefer the chicken to the genuine halibut, which is where they show good judgment.

Barracuda, Sea Bass, Spanish Mackerel, Yellow Tail.

All these fish are, more properly speaking, southern California fish, although some of the varieties frequently get as far north as San Francisco Bay. At certain seasons, Monterey Bay gives up good catches of these fish. They are a popular table fish, and usually not very high in price.

Albacore.

A species of tuna, caught in southern California waters, and during the season very abundant. They are not at all popular as a table fish, but are principally used for canning. This industry has grown beyond belief and promises to tax the fish supply. The merit of the canned fish is unquestioned and the demand is constantly expanding.

Compulsory salting of stock on U. S. National Forest. Salting done at definite places, which become salt licks for deer. (Photo by courtesy of U. S. Forest Service.)

THE NATIONAL FORESTS IN CALIFORNIA.

By W. C. Hodge, Forest Examiner, U. S. Forest Service.

From the earliest times forestry has been associated with the protection of game. In the year 1598 the Englishman, Manwood, in his treatise on the "Laws of the Forest," defines a forest as "a certain territory of woody grounds, fruitful pastures, privileged for wild beasts and fowls of forest, chase, and warren to nest and abide in, in the safe protection of the king." Since Manwood's time the functions of the forest have greatly increased, so that instead of being solely valuable as a pleasure ground they are now chiefly valuable for the production of wood and the conservation of water. But their usefulness for recreation purposes is still extremely great, and although the production of timber and the maintenance of the water supply will henceforth outrank in importance the game production feature, this last will always continue to be a valuable resource.

As a forest was formerly a game preserve, so a forester was formerly a gamekeeper. With the shifting of the functions of the forest came about a change in the duties of the forester. Nowadays, although the function of game protection is still important, it is subordinate to the work of forest administration and forest protection.

National forests are set apart to insure a perpetual supply of timber for the use and necessities of the people of the United States, and to prevent destruction of the forest cover which regulates the flow of streams. They "are open to all persons for all lawful purposes. The timber, water, pasture, and other resources are for the use of the people, and the minerals are open to exploitation just as on unreserved public land. * * * Twenty-five per cent of all receipts from national forests are given to the counties in which they lie, to be used for schools and roads. An additional ten per cent is expended by the Secretary of Agriculture upon roads and trails constructed primarily for the benefit of settlers within the forests."*

Between July 1, 1913, and June 30, 1914, receipts from the national forests in California amounted to $261,415.44. This revenue is derived from the sale or lease of the resources contained in the forests, the administration and protection of which constitutes the principal work of the service.

In California there are eighteen national forests. Their average size is one and one half million acres, and they include the roughest and most mountainous portions of the state. The areas selected for national

*The Use Book: A Manual for users of the National Forests. July 1, 1913. Copies may be obtained free of charge on application to the District Forester, 114 Sansome street, San Francisco.

forests are of two kinds: those actually or potentially valuable for the production of timber, and those whose cover is valuable chiefly for its effect on stream regulation. In southern California water conservation is the principal function; in northern California timber production is the most important; but all of the national forests serve both purposes to some extent.

Originally the national forests were called "forest reserves." The name was changed in order to bring out more clearly the point that the resources of the forests are to be used. The national forests are "reserved" in the sense that certain of the land laws which apply to the public domain are not effective on the forests; but none of the resources are reserved from use except in occasional cases where one use is incompatible with another.

All mature timber in the national forests which may be cut with benefit in accordance with the principles of forestry is for sale and will be offered as demand arises. Only stumpage is sold, the title to the land remaining with the government. Timber may be sold in amounts ranging from a few thousand feet up to whatever amount may be necessary to warrant the investment required for constructing a railroad or other means of transportation into comparatively inaccessible regions. Forage resources are sold under regulations whose leading objects are the protection and conservative use of all national forest land adapted for grazing; the permanent good of the live stock industry through proper care and improvement of grazing lands; and the protection of the settler and home builder against unfair competition in the use of the range.

Claims can be initiated upon lands within national forests only under the mining laws, the coal land laws, and the forest homestead act. Prospecting is not interfered with in any way. Free use of timber is granted to bona fide miners and prospectors who may not reasonably be required to purchase and who have not on their own claims a sufficient or practically accessible supply.

The use and occupancy of the agricultural lands in the forests is desired from every standpoint. Every added home helps in the upbuilding of the country. The forests are to serve the people in a permanent development of homes and industries. In addition, the settler is a great help—practically a necessity—in the protection and development of the forest itself. Every cultivated field is a fire-break; every ranch is a vantage point to prevent and fight fires; every settler may become a forest protector.

The national forests contain waterpowers of great value, the aggregate capacity of which is estimated at 12,000,000 horsepower. Permits for the development and use of these water powers are granted under

U. S. Forest Service bridge over American River, El Dorado National Forest. (Photograph by courtesy U. S. Forest Service.)

regulations which seek to prevent the appropriation of power sites for speculative purposes; to secure prompt and full development; to prevent monopoly; and to secure a reasonable compensation to the government for the use of the land occupied and the beneficial protection given to the watershed.

The administration of these various resources and the protection of the forests especially from fire constitute the principal work of the forest officers.

The national forests contain the principal habitats of all the important game animals of the west. No charge is made for hunting, fishing, or ordinary camping upon government land within the national forests and their use as recreation grounds is encouraged. No permits are issued for game preserves or any use of land which would result in preventing or restricting lawful hunting or fishing. Since game in general is regarded as under state control, the federal forest officers derive their authority in game protection from the state. They are not game wardens ex officio but only after appointment as such by the proper state authorities. National forest officers are, however, active in game protection, the policy of the government in this respect being expressed in the following regulation of the Secretary of Agriculture:

> All forest officers will cooperate with state or territorial officials, so far as they can without undue interference with their regular forest work, to enforce local laws for the protection of birds, fish, and game. When properly authorized to do so they will act *without additional pay* as deputy game wardens with full power to enforce local laws, but *may not accept any fees or rewards or parts of fines* on account of the enforcement of the state game laws. Forest officers and employees may, however accept any bounties voluntarily offered by any state or county or any association or individual for the destruction of predatory wild animals.

This is supplemented by the following instructions:

> Wild game adds materially to the enjoyment of the national forests by the public, and the preservation of game animals, birds, and fish is a public duty. This duty, however, rests primarily with the state. It is incumbent upon the forest service, under the act of May 23, 1908, to render all reasonable assistance in the protection of game within the national forests, but the service must be governed in its enforcement of the game laws by the attitude of the state officials. Furthermore, such assistance must be subordinated to the regular protective and administrative work of the forest service.

Acting under these instructions and in cooperation with the State Fish and Game Commission, the forest officers on 27,000,000 acres of national forest lands are fulfilling the duties of game wardens in California.

The administration of the national forests and the conduct of all matters relating to forestry which have been placed upon the Department of Agriculture by congress are under the direction of the Secretary of Agriculture, in charge of the Forester, who is chief of the Forest Service. The office of the Forester is in Washington, D. C.

For the better administration of the national forests, six districts have been established, each of which is in charge of a district forester who is aided by several assistant district foresters and specialists in various branches of the work.

District 5, which includes California and western Nevada, has its headquarters at 114 Sansome street, San Francisco, California.

Each national forest is in charge of a supervisor who plans the work on his forest under the instructions of the district forester and supervises its execution. His headquarters is located in a town conveniently situated with regard to his forest. Routine work involved in the supervision of timber sales, grazing, free use of timber, special use, and other contracts and permits, the carrying out of the protection and improvement plans, and other administrative activities, is performed by rangers. Each forest is divided into ranger districts of such size that, under ordinary conditions, all the regular work can be handled effectively by one fully equipped ranger with the necessary temporary assistants. The average ranger district has about 60,000 acres, but where means of travel and communication are good, or where there is only a small volume of business or the fire hazard is low, very much larger districts may be established.

From the sportsman's point of view, the most important activity of the forest service outside of the enforcement of the game laws is the protection of the forests from fire. The fire risk in California is excessive. The long dry season, the inflammable nature of the cover, and the habit, natural to California, of camping out during the summer, tend to produce severe fire conditions. The matter of camping is mentioned for the reason that most fires are of human origin. The seasoned camper is by no means a source of fire danger; he is, rather, a safety factor since he knows what precautions must be taken and helps to instruct those who are less experienced. But until a camper has had at least a season's experience in the forests he is apt to take unwarranted chances with camp fires, matches, burning tobacco, etc; and, speaking generally, the more people there are in the forests the greater the risk.

The fire organization on the national forests includes measures designed to prevent, detect, and suppress fires. Absolute prevention is, of course, impossible; lightning causes a certain percentage of fires each year, and a few fires start in other ways that may be fairly called unpreventable. Among these are the breaking of transmission lines, the accidental burning of houses in the forest, etc. There is also a theory very popular in California that broken bottles, by focusing the sun's rays upon inflammable material, are a frequent source of fires, but the theory has never been verified. During seven years in which

accurate fire records have been kept in California, not a single case of this sort has come to light.

Preventable fires can be prevented only by educating the public. This the service attempts to accomplish by various devices but especially by giving currency to the following Six Rules:

1. Matches. Be sure your match is out. Break it in two before you throw it away.

2. Tobacco. Throw pipe ashes and cigar or cigarette stumps in the dust of the road and stamp or pinch out the fire before leaving them. Don't throw them into brush, leaves, or needles.

3. Making Camp. Build a small campfire. Build it in the open, not against a tree or log or near brush. Scrape away the trash from all around it.

4. Leaving Camp. Never leave a campfire, even for a short time, without quenching it with water and then covering it with earth.

5. Bonfires. Never build bonfires in windy weather or where there is the slightest danger of their escaping from control. Don't make them larger than you need.

6. Fighting Fires. If you find a fire, try to put it out. If you can't, get word of it to the nearest U. S. Forest Ranger or State Firewarden at once. Keep in touch with the rangers.

The work of detecting and suppressing forest fires has been greatly systematized in recent years. Nowadays fires are reported mainly by lookouts whose function is not to fight fires but merely to discover and report them. The lookouts are located on commanding peaks, and remain on duty continuously. They are equipped with the necessary instruments and housed in cabins from the interior of which the entire area under protection can be kept in view. Each forest has several lookouts. Where the same area is under observation from two or more, the location of a fire can be determined very accurately even at a distance of many miles from either.

The lookout is in communication with the ranger either by telephone or by heliograph. Telephone service is the most certain and satisfactory but heliographs are used in situations where other facilities are lacking or are too costly. On receiving a report from a lookout, the ranger in whose district the fire is located takes immediate steps to put it out. His assistants are stationed at various strategic points each connected by telephone, and they remain within hearing distance of the bell. In fighting a forest fire it is as necessary to be prompt as it is in saving a burning house. For this reason the forest firemen are kept at their stations in constant readiness. This system has proved to be very economical. Instead of having large fires to fight, the majority of fires are kept to an area under one quarter of an acre and are handled by one or two men at the most.

Where large fires occur, due to exceptional circumstances, large bodies of fire fighters may be required. These are as far as possible organized in advance so that no time may be lost. They are recruited from near-by

ranchers, stockmen, lumbermen, and even from the settlements outside. Transportation facilities both for the men and for their subordinates are also arranged beforehand, and tools and nonperishable food supplies are cached in places where a demand for them is likely to arise.

In the more thickly settled portions of some forests, especially where there are numerous occasional visitors from near-by towns, moving patrolmen are employed. These, by calling the attention of campers to the necessity for taking proper precautions, and even by their very

Junction of phone and heliograph systems on national forests.
(Photo by courtesy U. S. Forest Service.)

presence, keep a great many fires from starting. They also attend to the extinguishing of such fires as occur, and in the case of large fires take charge of the fire fighting until their superiors relieve them.

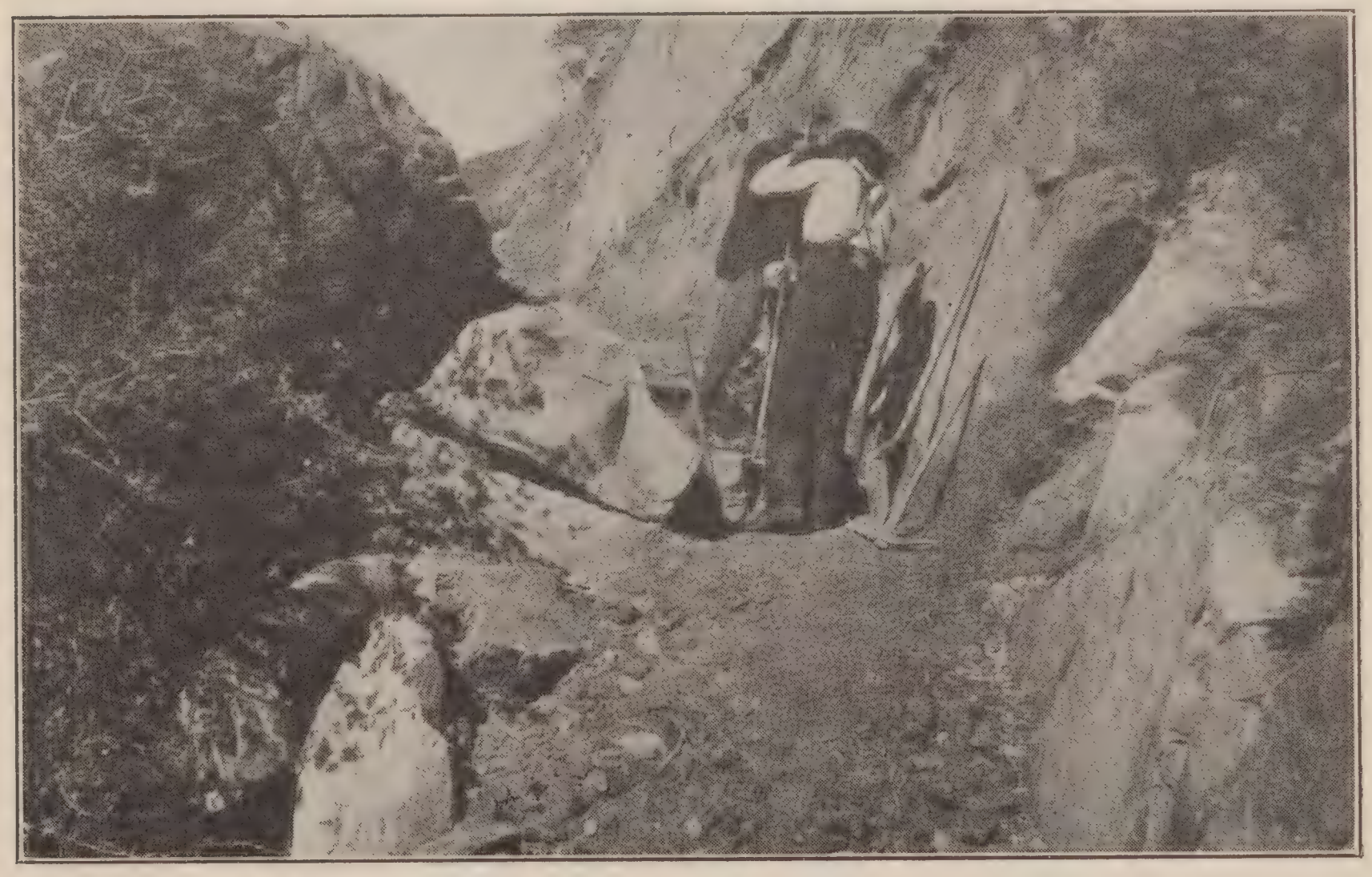
The system thus briefly described handled 1,628 fires on the national forests of California during the season of 1913. This was an exceptional year for electric storms, lightning having caused 804 fires or nearly half the total. Thirteen per cent of the fires were caused by campers. The total area of forest burned was a trifle less than 90,000 acres, 10,418 acres being timber land and the remainder brush or grass land. Only 275 fires attained an area of 10 acres or larger and 912 were caught and put out before they had covered a space 100 feet square.

One additional phase of fire protection work should be mentioned, namely, the safeguarding of dangerous areas either by reducing their inflammability or by constructing fire lines around them. Obviously the simplest way of cleaning up considerable areas that are in dangerous condition is by the careful use of fire. The debris resulting from the

cutting of timber under the timber sale regulations would form a serious menace to the young growth from which the future forest will be derived unless it were disposed of somehow. The usual practice is to require that the purchaser of government timber pile the brush, tops, limbs, and other debris in piles of suitable size which are fired at the proper season by the rangers.

A few years ago the opinion was very prevalent in California that the entire forest area should be burned over periodically in order to effect a general clean-up. This theory is now very largely discarded, and properly so. There are certain arguments in favor of it but it is chiefly based upon conceptions that are fundamentally wrong.

In the first place, although it appears to cost nothing, it is in reality an extremely expensive measure when performed effectively. Advocates of this theory—the so-called "light burning" theory—assume that it is



"Making trail" in the U. S. National Forest. (Photo by courtesy of U. S. Forest Service.)

only necessary to touch off a piece of forest at the proper season and that the fire will do its work without further attention. This is by no means the case. It is obvious that there are many areas that fire should be kept out of at all hazards, or, if they are to be burned at all, should be burned with extreme care. This means, then, that the fire must be kept under control, which would entail prohibitive expense as compared with the cost of keeping fires out entirely. One large tract in the northern Sierras was cleaned up in this fashion at a cost of 50 cents per acre. At the same rate, the expense of light burning the whole of the yellow pine belt in California would amount to at least $5,000,000.

But besides the prohibitive cost there are two other objections to this practice. One is that the young growth is inevitably destroyed; in fact, since thickets of young growth are specially inflammable, it is one of the objects of light burning to consume them. But the forests of the future can not be created all at once when they are needed. They require a development period of at least one hundred years before they produce material fit to cut into lumber. Any system which protects the mature timber at the expense of the young growth which is to replace it violates the principles of forestry, and, unless the sacrifice is absolutely unavoidable, of common sense as well. It was formerly argued that the sacrifice was necessary; that unless the debris which collected on the floor of the forest year after year was burned, unless the thickets of young growth were kept down, the final result would be a conflagration that nothing could control. This argument upon examination, is found not to hold. The record of the forest service in California during the last year proved that very severe fire conditions could be handled without any considerable loss of timber.

But, what is still more important, it is found by experiment that burning decreases the amount of litter not for a period of years but at most for an interval of a few months. The litter upon the ground at the time of the burning is consumed, but is replaced with more than normal rapidity by the debris shed from the trees scorched by the fire.

In short, light burning, in order to make the forest safe against future fires, must not be "light" but must be a fire of exactly the sort that it is the object of the practice to prevent. Fortunately the light burning method is no longer advocated to any great extent.

United States Department of Agriculture.

Forest Service—District 5.

CALIFORNIA AND WESTERN NEVADA.

District Forester, COERT DUBOIS; District Office, 114 Sansome Street, San Francisco.

National Forest.	Forest Supervisor.	Headquarters.
Angeles	R. H. Charlton	625 Federal Building, Los Angeles, Cal.
California	M. A. Benedict	Willows (winter), Oriental (summer), Glenn County, Cal.
Cleveland	S. W. Wynne	Escondido, San Diego County, Cal.
El Dorado	E. W. Kelley	Placerville, El Dorado County, Cal.
Inyo	A. H. Hogue	Bishop, Inyo County, Cal.
Klamath	W. B. Rider	Yreka, Siskiyou County, Cal.
Lassen	W. J. Rushing	Red Bluff (winter), Mineral (summer), Tehama County, Cal.
Modoc	W. G. Durbin	Alturas, Modoc County, Cal.
Mono	W. M. Maule	Gardenville, Douglas County, Nev.

Monterey	N. H. Sloane	Arbolado, Monterey County, Cal.
Plumas	D. N. Rogers	Quincy, Plumas County, Cal.
Santa Barbara	C. E. Rachford	Howard-Canfield Building, Santa Barbara, Cal.
Sequoia	A. B. Patterson	Hot Springs, Tulare County, Cal.
Shasta	R. F. Hammatt	Sisson, Siskiyou County, Cal.
Sierra	P. G. Redington	Northfork, Madera County, Cal.
Stanislaus	R. W. Ayres	Sonora, Tuolumne County, Cal.
Tahoe	R. L. P. Bigelow	Nevada City, Nevada County, Cal.
Trinity	W. A. Huestis	Weaverville, Trinity County, Cal.

THE AMERICAN ARMY OF HUNTERS.

By Ernest Schaeffle.

Do we not sometimes overlook the fact that America has a "standing army" of over 5,000,000 hunters, trained in the use of firearms, accustomed to the most strenuous exercise, and recruited from the most active, courageous part of the population?

And singularly enough this splendid "army" costs the government not a cent in appropriation nor a moment's anxiety or directorship, but pays its own bills and administers its own affairs. Furthermore, the "army" about which we are speaking takes no man from useful industry during times of peace, but rather increases the productive capacity of its members and in many ways makes of them healthier, happier and more useful members of society. Of what other "army" can this much be said?

We are inspired to write of this "army" at this particular moment, knowing that the thoughts of most Americans are clustered around the central ideas of war, armies and the safety of the nation. At a time like this many of us are likely to regret the fact that our regular army is so small and to rather condemn our peace time determination to get along with less than a hundred thousand soldiers. We are also likely to give attention to the militarist with his "I told you so" impudence and suggestion of an European system.

Just at this point it is well for us to take a long breath and collect our scattered wits, for have we not as a nation always met every emergency that called for an intelligent, courageous army of men who could and would shoot? And after reviewing certain conditions in our national life how can we doubt our ability to meet future emergencies as they may arise? The American people have always been a nation of hunters. We have lived in a land blessed by nature with an abundance of game and have always had the privilege of hunting such game in a degree enjoyed by few other peoples in modern times. Given the supply and the opportunity, quite naturally the game has been hunted, universally and hard, for man is still a hunter and full of the desire to kill. In the country's infancy game was taken for food, while in later years it has been regarded more and more as the object and reward of sport; but always it has been hunted, from one ocean to the other and by millions of our heartiest, most "American" men.

With the wonderful advance that has been made in our country in the mechanical trades and businesses has come wonderful improvement and cheapening in firearms and ammunition, so that today the "poor man" with an outlay of $25 is the practical equal in the field of his English brother with an outfit running into the hundreds of dollars.

Which all brings us back to our theme:

The country has now (and has had since its beginning), an "army" of hunters, confined to the game fields in times of peace, but ready for defense of the nation in time of peril. This "army" would never have existed and would not exist now had we not recognized the injustice of conditions in older countries and guarded our inherent right to bear arms and to hunt. But where would our army be if the land had no game, and where will it be in future if the game we have saved is to be exterminated, as seems to be the real purpose of even many who call themselves "game protectors" and what not?

The best guarantee of American freedom from foreign invasion and more dangerous aggression and demoralization at home would seem to be a rifle in every household, with the young men trained in its use by experience in the hunting field after game.

CALIFORNIA FISH AND GAME COMMISSION ADMINISTRATIVE DISTRICTS.

San Francisco District.

Office: 734 Mills Building, San Francisco, California.

Alameda County.	Marin County.	San Mateo County.
Contra Costa County.	Mendocino County.	Santa Clara County.
Del Norte County.	Monterey County.	Santa Cruz County.
Humboldt County.	San Benito County.	Sonoma County.
Lake County.	San Francisco County.	

Area, 20,650 square miles; population, 1910, 1,002,405.

Sacramento District.

Office: Forum Building, Sacramento, California.

Alpine County.	Modoc County.	Sierra County.
Amador County.	Napa County*	Siskiyou County.
Butte County.	Nevada County.	Solano County*
Calaveras County.	Placer County.	Sutter County.
Colusa County.	Plumas County.	Tehama County.
El Dorado County.	Sacramento County.	Trinity County.
Glenn County.	San Joaquin County.	Yuba County.
Lassen County.	Shasta County.	Yolo County.

Area, 45,903 square miles; population, 1910, 370,420.

*On August 1, 1914, Napa and Solano counties will be transferred to the San Francisco District.

Los Angeles District.

Office: 510 Consolidated Realty Building, Los Angeles, California.

Imperial County.	Orange County.	San Luis Obispo County.
Inyo County.	Riverside County.	Santa Barbara County.
Los Angeles County.	San Bernardino County.	Ventura County.
Mono County.	San Diego County.	

Area, 61,186 square miles; population, 1910, 779,709.

Fresno District.

Office: Forsyth Building, Fresno, California.

Fresno County.	Madera County.	Stanislaus County.
Kern County.	Mariposa County.	Tuolumne County.
Kings County.	Merced County.	Tulare County.

Area, 29,331 square miles; population, 1910, 225,115.

BOARD OF FISH AND GAME COMMISSIONERS.

Roster June 30, 1914.

Commissioners appointed by the Governor, by and with the consent of the Senate.
Term at pleasure of the Governor. No compensation.

F. M. Newbert, *President,* Sacramento.....Appointed August 3, 1911
M. J. Connell, Los Angeles.....Appointed February 1, 1909
Carl Westerfeld, San Francisco.....Appointed November 28, 1911
Ernest Schaeffle, *Executive Secretary*.....Appointed November 29, 1911

Head office, San Francisco, 734 Mills Building.

Under direction of Commissioner Carl Westerfeld.

Ernest Schaeffle..Executive Secretary
J. S. Hunter.....Assistant Secretary
R. D. Duke.....Attorney
O. H. Reichling.....Cashier
Leo N. Pettit.....Record Clerk
Daniel O'Connell.....Clerk
H. R. Dunbar.....Clerk
Mae D. Horn.....Stenographer
Lillian Ciegler.....Stenographer

Sacramento office, Forum Building.

Under direction of Commissioner F. M. Newbert.

George Neale.....Assistant
Geo. T. Hanley..Clerk and stenographer
Leslie Rust.....Office Boy

Los Angeles office, 510 Consolidated Realty Building.

Under direction of Commissioner M. J. Connell.

H. I. Pritchard.....Assistant
E. A. McKee..Clerk and stenographer

Fresno office, 347 Forsyth Building.

Under direction of Deputy A. D. Ferguson.

Lida H. Ransom.....Clerk and stenographer

LIST OF REGULAR DEPUTIES.

San Francisco District.

Alameda County.

J. L. Bundock.....Oakland
Earl Downing.....Pleasanton

Del Norte County.

Paul Smith.....Requa

Humboldt County.

Earl P. Barnes.....Eureka
Theo. M. Benson.....Fortuna

Mendocino County.

Chas. R. Perkins.....Fort Bragg
B. H. Miller.....Ukiah

Marin County.

Vernon D. Thomas.....San Rafael

Monterey County.

Phil H. Oyer.....Pacific Grove
Frank Shook.....Salinas

Santa Cruz County.

J. H. Hill.....Watsonville
R. B. Heacock.....Seabright

Santa Clara County.

I. L. Koppel.....San Jose

San Francisco County.

M. S. Clark.....San Francisco
A. M. Fairfield.....San Francisco
H. E. Foster.....San Francisco
M. L. Cross.....San Francisco
C. E. McPherson.....San Francisco
Edward Boyle.....San Francisco
A. M. Cunningham.....San Francisco

Sonoma County.

A. F. Lea ---------- Cloverdale
Henry Lencioni ---------- Healdsburg

Launch "Quinnat."

H. B. Nidever, Captain
J. Christensen, Engineer ---------- Headquarters, Vallejo

Sacramento District.

Amador County.

Frank S. Parke ---------- Sutter Creek

Calaveras County.

David E. Roberts ---------- Murphys

Colusa County.

S. J. Carpenter (on furlough) ---------- Maxwell

El Dorado County.

Euell Gray ---------- Shingle

Lassen County.

Frank P. Cady ---------- Susanville

Modoc County.

Geo. W. Courtright ---------- Straw

Nevada County.

R. C. O'Connor ---------- Grass Valley
S. J. Mandeville ---------- Truckee

Napa County.

W. J. Moore ---------- Napa

Placer County.

Chester A. Scroggs ---------- Loomis

Sacramento County.

W. J. Green ---------- Sacramento
C. H. Blemer ---------- Sacramento

Shasta County.

J. S. White ---------- Redding

Siskiyou County.

J. W. Harris ---------- Greenview

Solano County.

Wm. H. Armstrong ---------- Vallejo

Sutter County.

E. D. Ricketts ---------- Live Oak

San Joaquin County.

Richard Squire ---------- Lodi
Geo. J. Merritt ---------- Manteca

Trinity County.

G. O. Laws ---------- Weaverville

Tehama County.

T. W. Birmingham ---------- Red Bluff

Yolo County.

R. L. Sinkey ---------- Woodland

Los Angeles District.

Inyo County.

E. H. Ober ---------- Big Pine

Mono County.

A. J. Stout ---------- Mono Lake

Orange County.

W. K. Robinson ---------- El Toro

Riverside County.

James H. Gyger ---------- Elsinore

Los Angeles County.

I. A. Bordner ---------- Long Beach

Santa Barbara County

H. J. Abels ---------- Santa Maria

San Bernardino County.

James A. Vale ---------- San Bernardino

San Diego County.

Webb Toms ---------- San Diego
A. T. Norton (crawfish inspector) ---------- San Diego

San Luis Obispo County.

C. E. Cook ---------- San Luis Obispo

Ventura County.

John J. Barnett ---------- Ventura

Fresno District.

Fresno County.

D. H. Hoen ---------- Fresno
S. L. N. Ellis ---------- Fresno
F. A. Bullard ---------- Dunlap

Kern County.

Tipton Mathews ---------- Wasco

Kings County.

E. W. Smalley ---------- Hanford

Merced County.

M. A. Wright ---------- Merced

Stanislaus County.

J. E. Newsome ---------- Newman

Tuolumne County.

Geo. F. Grant ---------- Columbia

* * *

Hayward Game Farm.

W. N. Dirks ---------- Superintendent
R. Gansberger ---------- Laborer

* * *

Hatcheries—screen and ladder investigation.

W. H. Shebley, Superintendent of hatcheries ---------- Sisson
J. H. Hoerl, Fish cultural clerk ---------- Sisson
A. E. Doney, Screen and ladder surveyor and spawn taker ---------- Sisson
A. E. Culver, Screen surveyor ---------- Sisson
Chas. L. Gilmore, Engineer-Draftsman ---------- Sacramento
Jack Forrest, Apprentice draftsman ---------- Sacramento
R. W. Requa, Second class fish culturist ---------- Chico

Sisson hatchery and spawning stations.

F. McCrea ---------- First class messenger, distribution car, and fourth class fish culturist
C. Nixon ---------- Third class fish culturist
F. Sullaway ---------- Fourth class fish culturist
W. L. Gatchell ---------- Fourth class fish culturist
E. Clessens ---------- Fourth class fish culturist
Geo. McCloud, Sr. ---------- Fourth class fish culturist
J. Shebley ---------- Fourth class fish culturist
Norman Sisson ---------- Fourth class fish culturist
R. I. Bassler ---------- Messenger, distribution car, and fourth class fish culturist
L. Phillips ---------- Messenger distribution car and fourth class fish culturist
J. B. Sollner ---------- Fourth class fish culturist
J. E. Winchcomb ---------- Pond fish feeder
F. Clessens ---------- Carpenter
Wm. Heffernan ---------- Watchman
R. Rupp ---------- Pond Watchman
A. E. Glidden ---------- Temporary laborer
B. J. Benning ---------- Temporary laborer
Geo. McCloud, Jr. ---------- Temporary laborer
G. L. Morrison ---------- Laborer
A. Hill ---------- Temporary laborer

Tahoe Hatcheries.

E. W. Hunt ---------- Second class fish culturist
F. F. Anderson ---------- Third class fish culturist (temporary)
Geo. E. West ---------- Fourth class fish culturist
A. Steininger ---------- Temporary laborer
Wm. Storrs ---------- Temporary laborer

Price Creek Hatchery.

W. O. Fassett (leave of absence) ---------- Second class fish culturist

Ukiah Hatchery.

A. V. La Motte ---------- Second class fish culturist
W. R. Crockett ---------- Temporary fish culturist

Unattached.

F. A. Shebley (leave of absence) ---------- Second class fish culturist

INVENTORY OF STATE PROPERTY IN CHARGE OF FISH AND GAME COMMISSION.

Recapitulation Statement, June 30, 1914.

Office equipment	$4,901 46
Sundry property in charge of employees	2,357 59
Game farm, cottage, equipment, birds, etc.	7,151 20
Patrol launches	7,658 48
Hatcheries at Sisson, Tahoe, Tallac, Glen Alpine, Price Creek, Wawona, Ukiah and spawning stations, including fish distribution car, buildings, water rights, equipment, etc.	59,535 24
Total	$81,603 97

FINANCIAL STATEMENT, YEARS 1912-1913 AND 1913-1914.

Showing Revenues for this Period.

Balance in state treasury, June 30, 1912		$32,668 56
Receipts.		
Sale of hunting licenses—1911-1912	$5,525 48	
Sale of hunting licenses—1912-1913	166,130 93	
Sale of hunting licenses—1913-1914	158,063 65	
		329,720 06
Sale of market fishing licenses—1912-1913	$23,857 50	
Sale of market fishing licenses—1913-1914	26,985 00	
		50,842 50
Sale of wholesale fish and game dealers' licenses—1911-1912	$125 00	
Sale of wholesale fish and game dealers' licenses—1912-1913	1,360 00	
Sale of wholesale fish and game dealers' licenses—1913-1914	1,280 00	
		2,765 00
Sale of trout farm licenses—1912-1913	$35 00	
Sale of trout farm licenses—1913-1914	20 00	
		55 00
Sale of anglers' licenses—1914		13,229 25
Sale of game farm products—1912-1913	$532 00	
Sale of game farm products—1913-1914	734 40	
		1,266 40
Sales of sundry articles, rebates on scrip books, etc.		122 10
Received from importers of crawfish for inspecting same in closed season—1912-1913	$793 33	
Received from importers of crawfish for inspecting same in closed season—1913-1914	900 00	
		1,693 33
Fines paid into state treasury for violations of fish, game, and license laws—1912-1913	$17,938 27	
Fines paid into state treasury for violations of fish, game, and license laws—1913-1914	14,934 32	
		32,872 59
Total		$465,234 79

DISBURSEMENTS, YEAR 1912-1913.

San Francisco District—salaries, traveling expenses, rentals, supplies, etc.	$48,799 70
Sacramento District—salaries, traveling expenses, rentals, supplies, etc.	43,861 25
Los Angeles District—salaries, traveling expenses, rentals, supplies, etc.	17,384 32
Fresno District—salaries, traveling expenses, rentals, supplies, etc.	21,084 50
Game Farm—salaries, traveling expenses, rentals, supplies, etc.	5,827 93
Patrol launches—salaries, expenses, supplies, etc.	4,574 20
Prosecutions and allowances	9,774 63
Commissions—hunting and market fishing licenses	15,050 65
Lion bounties	5,280 00
Commissioners' traveling expenses	247 75
Scientific investigations and publicity—salaries, expenses, supplies, etc.	8,305 67
Sundry bills	7,293 47
Screen and ladder surveys—salaries, expenses, supplies, etc.	4,841 66
Superintendent of hatcheries and assistants—salaries, expenses, supplies, etc.	2,636 10
Sisson hatchery—salaries, expenses, supplies, etc.	15,130 18
Tahoe and Tallac hatcheries—salaries, expenses, supplies, etc.	2,986 08
Price Creek hatchery—salaries, expenses, supplies, etc.	2,052 49
Ukiah hatchery—salaries, expenses, supplies, etc.	343 90
Wawona hatchery—salaries, expenses, supplies, etc.	154 05
Bogus Creek station—salaries, expenses, supplies, etc.	950 74
Brookdale hatchery and Swanton spawning station—salaries, expenses, supplies, etc.	4,094 81
Sacramento experimental station—salaries, expenses, supplies, etc.	977 14
Fish distribution car—salaries, expenses, supplies, etc.	3,387 05
	$225,038 27

DISBURSEMENTS, 1913-1914.

General Fish and Game Patrol, Administration, etc.

San Francisco Division.

Salaries of deputies and employees	$37,404 50	
Traveling expenses, rentals, office supplies, etc.	17,096 84	
		$54,501 34

Sacramento Division.

Salaries of deputies and employees	$25,834 00	
Traveling expenses, rentals, office supplies, etc.	13,050 14	
		38,884 14

Los Angeles Division.

Salaries of deputies and employees	$12,227 00	
Traveling expenses, rentals, office supplies, etc.	4,953 98	
		17,180 98

Fresno Division.

Salaries of deputies and employees	$11,746 00	
Traveling expenses, rentals, office supplies, etc.	6,894 85	
		18,640 85

Miscellaneous Expenditures.

Traveling expenses, commissioners	880 02
Prosecutions and allowances	8,486 68
General printing, license lithographing, etc.	6,458 28
Sub-total, fish and game patrol, administration	$145,032 29

Sub-total fish expenditures, 40 per cent, $58,012.92.
Sub-total game expenditures, 60 per cent, $87,019.37.

Fishery Expenditures.

Superintendent of hatcheries and assistants.

Salaries	$4,072 50	
Traveling expenses, supplies, etc.	1,009 81	
		$5,082 31

Sisson hatchery.

Salaries	$13,476 23	
Traveling expenses, supplies, etc.	7,881 64	
		21,357 87

Tahoe and Tallac hatcheries.

Salaries	$2,650 17	
Traveling expenses, supplies, etc.	679 73	
		3,329 90

Price Creek hatchery.

Salaries	$1,791 67	
Traveling expenses, supplies, etc.	1,016 53	
		2,808 20

Ukiah hatchery and Snow Mountain.

Salaries	$904 25	
Traveling expenses, supplies, etc.	419 90	
		1,324 15

Wawona hatchery.

Salaries	$487 50	
Traveling expenses, supplies, repairs, etc.	247 70	
		735 20

Klamath spawning stations.

Salaries	$2,094 50	
Traveling expenses, supplies, repairs, etc.	1,322 76	
		3,417 26

Brookdale hatchery.

Salaries	$320 00	
Traveling expenses, supplies, repairs, etc.	77 55	
		397 55

Sacramento experimental station.

Rental	12 00

Screen and fishway surveys and supervision.

Salaries	$6,607 33	
Traveling expenses, supplies, etc.	2,632 30	
		9,239 63

Fish patrol (launches, etc.).

Salaries	$2,649 00	
Traveling expenses, supplies, repairs, etc.	1,768 91	
		4,417 91

Fish distribution (car and messenger).

Salaries	$1,751 02	
Traveling expenses, supplies, repairs, etc.	1,907 87	
		3,658 89

Fish transplanting (pack train, messenger, etc.).

Traveling expenses, supplies	167 51

Miscellaneous expenditures.

Anglers' license commissions	1,148 30
Market fishing license commissions	532 75
Crawfish inspection	1,100 00
Sub-total fish expenditures	$58,729 43

Game Expenditures.

Hayward game farm.

Salaries	$2,698 50	
Traveling expenses, repairs, supplies, etc.	3,978 86	
		$6,677 36

Miscellaneous expenditures.

Hunting license commissions and refunds	14,680 70
Mountain lion bounties	4,100 00
Sub-total game expenditures	$25,458 06

Fish and game research and publicity.

Salaries	$600 00	
Traveling expenses, supplies, etc.	491 04	
		$1,091 04
Sub-total fish expenditures, 40 per cent	$436 42	
Sub-total game expenditures, 60 per cent	654 62	

Recapitulation, 1913-1914.

Total fish expenditures	$117,178 76
Total game expenditures	113,132 06
Grand total, all expenditures	$230,310 82

SUMMARY OF PROSECUTIONS FOR VIOLATIONS OF STATE GAME LAWS.

July 1, 1912, to June 30, 1914.

Offense	Number of arrests	Convicted	Acquitted and dismissed	Sentence suspended and probation	Pending	Number of days imprisonment	Fines imposed	Fines collected
Violations hunting license law	526	489	36	20	1	280	$8,386 50	$7,658 50
Deer—killing, pursuing, possession, close season; excess bag limit	166	134	30	4	2	779	4,957 50	3,548 50
Female deer and fawns—killing and possession	64	54	10	2		182	2,640 00	2,293 00
Deer hides—female; evidence of sex removed; buying or selling (hides and meat)	18	10	7		1	100	675 00	375 00
Ducks—killing and possession, close season	28	25	3			25	790 00	765 00
Ducks—excess bag limit	67	43	23	4	1		1,340 00	1,315 00
Ducks—Using a trained animal for taking; night shooting; shooting from power boat in motion	54	40	12	2	2		725 00	650 00
Quail—killing, possession, close season	82	80	2	6		62	1,895 00	1,733 00
Quail—excess bag limit; buying or selling	8	8					425 00	425 00
Doves—killing, possession, close season; excess bag limit	33	32	1			55	680 00	570 00
Snipe, curlew, rail, plover and other shore birds—killing, possession, close season; excess bag limit	13	12	1	1		50	305 00	255 00
Pheasants, swans—killing, etc.	2	2					75 00	75 00
Non-game birds—killing, possession, shipping	122	113	9	8			1,394 50	1,214 50
Tree squirrels—killing, possession, close season	18	9	9	2			230 00	180 00
Cottontail and bush rabbits, killing, possession, close season; excess bag limit	77	72	5	16			1,355 00	1,045 00
Elk—possession of meat	1	1					50 00	50 00
Illegal trapping of birds and possession without permit	2	2					50 00	50 00
Totals	1,281	1,126	148	65	7	1,533	$25,973 50	$22,202 50

SUMMARY OF PROSECUTIONS FOR VIOLATIONS OF STATE FISH LAWS.

July 1, 1912, to June 30, 1914.

Offense	Number of arrests	Convicted	Acquitted and dismissed	Sentence suspended and probation	Pending	Number of days imprisonment	Fines imposed	Fines collected
Fishing (market) without a license	123	102	18	14	3	88	$1,559 00	$816 00
Fishing (angling) without a license	15	14	1	1	----------	2	535 00	470 00
Wholesale dealing in fish without a license; not keeping a register of fish purchased	8	3	4	----------	1	----------	35 00	35 00
Illegal fishing apparatus (nets and lines)	96	66	23	11	7	391	2,530 00	1,648 00
Salmon—catching, possession, close season	17	5	9	2	3	2	360 00	348 00
Saturday and Sunday fishing, salmon, shad and striped bass	6	4	2	1	----------	150	60 00	60 00
Striped bass—close season; underweight; exporting	46	33	13	6	----------	----------	520 00	455 00
Black bass—close season; excess bag limit; catching by means other than hook and line	17	15	2	2	----------	65	275 00	215 00
Trout—close season; excess bag limit; catching by means other than hook and line; buying or selling under weight	56	46	10	8	----------	----------	1,020 00	1,020 00
Steelhead trout—close season; spearing	37	31	6	4	----------	195	995 00	575 00
Catfish—undersize, buying or selling	25	21	4	1	----------	10	545 00	545 00
Taking fish within 50 feet of a fishway	4	4	----------	----------	----------	----------	250 00	250 00
Using explosives to take fish	15	7	8	2	----------	250	1,500 00	125 00
Polluting waters—(oil, sawdust, etc.)	13	3	6	----------	4	----------	550 00	250 00
Shipping fish not properly marked	1	1	----------	----------	----------	----------	20 00	20 00
Taking fish—reservations	29	25	4	----------	----------	----------	850 00	680 00
Young of fish—taking or possession	11	9	2	----------	----------	----------	160 00	140 00
Salt water perch—shipping for sale	1	1	----------	----------	----------	----------	10 00	10 00
Taking surf fish other than with hook and line	2	2	----------	----------	----------	----------	20 00	----------
Trawling in District No. 6	13	----------	----------	----------	13	----------	----------	----------
Crabs—close season; undersize; female	98	66	32	21	----------	----------	790 00	760 00
Abalones—close season; undersize; other than for food purposes	29	25	4	2	----------	26	530 00	399 00
Crawfish, lobsters—undersize and oversize	18	16	2	----------	----------	----------	365 00	325 00
Clams—excess bag limit; undersize	32	28	4	1	----------	10	358 00	125 00
Totals	712	527	154	76	31	1,189	$13,837 00	$9,271 00

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RECAPITULATION.

Arrests:		
Fish cases		712
Game cases		1,281
Total		1,993
Convictions:		
Fish cases	527	
Game cases	1,126	
		1,653
Acquittals and dismissals:		
Fish cases	154	
Game cases	148	
		302
Pending cases:		
Fish cases	31	
Game cases	7	
		38
Total		1,993
Fines imposed:		
Fish cases		$13,837 00
Game cases		25,973 50
Total		$39,810 50
Fines collected:		
Fish cases		$9,271 00
Game cases		22,202 50
Total		$31,473 50
Number of days imprisonment imposed:		
Fish cases		1,189
Game cases		1,533
Total		2,722

Total Arrests for a Period of Twelve Years.

1902–1904	550
1904–1906	774
1906–1908	1,192
1908–1910	1,771
1910–1912	2,063
1912–1914	1,993
Total	8,343

SEIZURES OF FISH, GAME AND ILLEGALLY USED FISHING APPARATUS.

July 1, 1912, to June 30, 1914.

Illegally used fishing apparatus (nets and lines)	*223	
Salmon	11,410	pounds
Striped bass	7,826	pounds
Steelhead	781	pounds
Black bass	20	pounds
Catfish	1,842	pounds
Trout	241	pounds
Crabs	5,775	
Abalones	304	
Crawfish	898	
Clams	1,976	
Miscellaneous fish	1,153	pounds
Crawfish traps	64	
Ducks	6,656	
Quail	273	
Shore birds	36	
Doves	96	
Non-game birds	892	
Deer meat	2,190	pounds
Hides	60	
Rabbits (cottontail and bush)	1,318	
Squirrels	11	
Golden eagle (mounted)	2	

Illegally used fishing apparatus, after condemnation in superior courts, is destroyed by the board; all wholesome fish and game is donated to public and charitable institutions, from whom many grateful letters of acknowledgment have been received.

During the period from July 1, 1912, to June 30, 1914, there were 1,191 searches and inspections of markets, restaurants, private individuals, conveyances, etc., for illegal fish and game, made by deputies. Of this number, 975 were made in San Francisco.

*The 223 nets and lines seized represent 12,305 fathoms, or 73,834 feet.

HUNTING LICENSE SALES.

July 1, 1907, to June 30, 1914.

Counties	1907-1908	1908-1909	1909-1910	1910-1911	1911-1912	1912-1913	1913-1914
Alameda	$5,766	$4,359	$5,724	$7,071	$7,273	$8,218	$8,727
Alpine	60	60	36	70	109	94	64
Amador	1,079	880	945	1,002	950	1,263	1,404
Butte	2,375	2,414	2,419	2,731	2,878	3,035	3,097
Calaveras	972	736	734	829	1,116	1,480	1,505
Colusa	1,364	1,208	1,270	1,747	1,688	1,690	1,619
Contra Costa	1,660	1,288	1,296	1,474	1,660	1,980	2,226
Del Norte	322	369	312	322	292	262	200
El Dorado	1,087	947	864	955	1,026	1,298	1,337
Fresno	3,718	3,657	4,194	5,512	5,956	6,358	5,882
Glenn	698	672	796	1,027	1,102	1,197	1,235
Humboldt	2,843	2,595	3,056	3,652	3,451	3,555	3,280
Imperial	559	509	445	405	366	420	582
Inyo	916	916	1,055	1,010	950	1,011	1,228
Kern	2,095	2,521	3,550	4,734	5,039	5,301	4,600
Kings	1,010	950	1,233	1,352	1,246	1,564	1,278
Lake	1,217	929	1,028	1,194	1,243	1,143	1,108
Lassen	524	441	518	551	638	843	1,159
Los Angeles	12,545	12,225	13,109	15,298	13,136	19,216	20,547
Madera	745	619	793	727	799	971	939
Marin	939	905	763	981	608	896	292
Mariposa	395	360	325	300	341	429	393
Mendocino	----------	832	1,336	1,815	2,495	2,344	2,261
Merced	1,375	1,491	1,530	1,789	1,928	2,136	1,872
Modoc	450	413	406	506	599	870	815
Mono	194	181	235	257	292	224	247
Monterey	1,937	1,968	2,239	2,287	2,081	2,193	2,002
Napa	1,412	1,423	2,025	1,990	2,006	2,166	2,140
Nevada	1,260	1,524	1,601	1,624	1,665	1,603	1,681
Orange	1,946	1,822	2,200	2,351	2,363	2,834	2,715
Placer	1,583	1,534	1,786	1,879	2,000	1,831	2,306
Plumas	645	618	458	545	518	706	789
Riverside	2,477	2,448	3,347	3,271	2,956	3,429	2,899
Sacramento	3,851	3,515	3,588	4,035	4,737	4,743	5,164
San Benito	737	793	1,060	1,006	1,120	1,201	1,049
San Bernardino	3,314	3,071	3,619	3,675	3,498	4,287	3,848
San Diego	3,020	2,929	3,454	3,513	3,651	5,263	5,637
San Francisco	2,120	1,252	1,015	885	*	*	*
San Joaquin	2,785	3,050	3,245	3,402	3,629	4,470	4,481
San Luis Obispo	1,533	1,553	1,341	1,504	1,393	1,450	1,338
San Mateo	1,513	1,299	1,524	1,765	1,698	1,773	1,749
Santa Barbara	1,873	1,796	1,803	1,759	1,900	2,087	2,073
Santa Clara	3,855	3,193	3,612	4,212	4,595	5,400	4,809
Santa Cruz	2,045	2,027	2,030	1,959	2,345	2,607	2,564
Shasta	2,120	2,083	2,163	2,260	1,945	1,997	2,092
Sierra	321	239	164	148	167	199	324
Siskiyou	2,881	2,748	2,843	3,271	3,373	3,643	3,503
Solano	2,042	1,948	1,597	2,092	2,475	2,521	2,287
Sonoma	4,030	4,027	4,390	4,959	5,730	6,178	6,150
Stanislaus	1,162	1,182	1,415	1,699	1,556	1,631	1,630
Sutter	588	540	631	905	898	928	879
Tehama	1,180	1,161	1,135	1,342	1,243	1,420	1,500
Trinity	522	506	616	793	693	889	927
Tulare	2,525	2,703	2,998	2,770	3,075	3,679	3,297
Tuolumne	1,092	1,052	1,036	1,062	1,094	1,145	1,287
Ventura	1,564	1,462	1,862	1,949	1,857	2,054	2,152
Yolo	1,454	1,408	1,500	1,699	1,956	2,392	2,199
Yuba	901	832	960	1,277	1,194	1,365	1,389
†Fish and Game Commission	13,231	14,767	17,221	14,838	14,233	16,910	16,488
‡Fish and Game Commission	----------	----------	----------	62	374	979	1,116
§Fish and Game Commission	----------	----------	----------	3,166	4,982	2,014	1,224
#Fish and Game Commission	----------	----------	----------	----------	----------	199	526
Totals	$118,427	$114,950	$128,450	$143,265	$146,181	$165,984	$164,111

*San Francisco county clerk sold no hunting licenses during years indicated.
†San Francisco office. ‡Fresno office. §Los Angeles office. #Sacramento office.

STATEMENT OF LION BOUNTIES PAID BY FISH AND GAME COMMISSION FROM OCTOBER, 1907, TO JUNE 30, 1914.

Counties	1907	1908	1909	1910	1911	1912	1913	Jan. 1 to June 30, 1914	Total
Alameda		1							1
Amador		3		1	2	2			8
Butte	2	11	5	2	4	3	2	1	30
Calaveras		1	4	1		1		1	8
Colusa		3		3	3	1	1	2	13
Del Norte		10	12	4	11	11	23	4	75
El Dorado	2	7	2	1	8	9	6		35
Fresno		1	3	1		4		1	10
Glenn		13	6	6	1	4	5	1	36
Humboldt	10	113	67	71	42	50	41	24	418
Inyo						1			1
Kern		8	10	12	5	9	10	2	56
Lake	2	14	11	13	9	10	7	2	68
Lassen			1		2	1	2		6
Los Angeles		7	1	2	2		2	1	15
Madera		3	5	1		1	1	9	20
Mariposa	2	4	3	6	2	1	4	7	29
Mendocino	3	44	18	11	16	17	24	11	146
Merced				1					1
Modoc			1	1	1				3
Monterey		14	11	7	1	3	9	3	48
Mono								2	2
Napa				1		2			3
Nevada		1	1	1					3
Orange			1	1	1		1		4
Placer		5	4	1	2	7	3	1	23
Plumas		2		3		1	2		8
Riverside		2	5			4	2		13
San Benito		1	2	1	2	11	3	2	22
San Bernardino		5	2	1	2		2	1	13
San Diego		3	5	5	8	3	1	1	26
San Luis Obispo		11	5	9	4	4	5	4	42
San Mateo				1					1
Santa Barbara		7	24	7	3	5	11	1	58
Santa Clara			4			1	1	1	7
Santa Cruz				1					1
Shasta	1	25	32	31	29	28	22	5	173
Sierra		1				3	2		6
Siskiyou	1	31	35	45	25	25	22	13	197
Sonoma			2	4	1	4	1	1	13
Stanislaus			2		1				3
Sutter						1			1
Tehama	3	31	19	25	10	22	27	2	139
Trinity	9	86	34	32	22	15	14	10	222
Tulare		6	8	11	4	5	3	3	40
Tuolumne		6	10	5	2	4	1	1	29
Ventura		1	6	4	6	2		1	20
Yuba		1			2				3
Totals	37	482	361	333	233	275	260	118	2,099

Total bounty paid, at $20 per scalp, $41,980.

NUMBER OF DEER KILLED IN THE VARIOUS COUNTIES DURING THE OPEN SEASONS OF 1911, 1912, 1913.

District No. 1.

County	1911	1912	1913
Del Norte	No record	42	See Dist. 2
Siskiyou	275	300	313
Modoc	54	129	129 Est.
Lassen	39	50	38
Shasta	506	281	396
Trinity	707	367	522
Humboldt	711	256	See Dist. 2
Tehama	5	159	165
Totals	2,297	1,584	1,563

District No. 2.

Mendocino	422	546	345
Glenn	42	No record	396
Colusa	136	144	8
Lake	45	494	161
Sonoma	664	261	193
Napa	29	31	72
Yolo	No record	51	No record
Solano	23	12	14
Marin	355	363	325
Del Norte	No record	See Dist. 1	120
Humboldt	See Dist. 1	See Dist. 1	700
Totals	1,716	1,902	2,334

District No. 3.

Plumas	28	10	23
Butte	2	9	No record
Sierra	6	No record	No record
Yuba	7	No record	No record
Sutter	No record	No record	No record
Nevada	88	117	38
Placer	71	40	46
El Dorado	202	240	248
Sacramento	35	78	6
Amador	3	11	17
Alpine	No record	No record	See Dist. 7
Calaveras	47	130	204
Tuolumne	183	250	226
Mariposa	14	No record	50 Est.
Mono	9	7	See Dist. 7
San Joaquin	No record	See Dist. 4	30
Totals	695	892	888

District No. 4.

San Joaquin	No record	30	See Dist. 3
Stanislaus	No record	60	35
Merced	No record	34	34 Est.
Madera	43	69	69 Est.
Fresno	182	124	30
Kings	No record	No record	No record
Tulare	276	266	266 Est.
Kern	112	156	350
Totals	613	739	784

Number of Deer Killed During 1911, 1912 and 1913—Continued.

District No. 5.

County	1911	1912	1913
Contra Costa	4	20	20 Est.
Alameda	52	270	420
San Francisco	No hunting	No hunting	No hunting
San Mateo	132	155	202
Santa Clara	19	350	543
Santa Cruz	69	109	85
San Benito	123	67	42
Monterey	404	510	552
San Luis Obispo	25	132	132 Est.
Santa Barbara	See Dist. 6	See Dist. 6	210
Totals	828	1,613	2,206

District No. 6.

Santa Barbara	114	214	See Dist. 5
Ventura	10	125	110
Los Angeles	17	186	89
Orange	27	38	16
San Diego	61	62	62
Imperial	No record	No record	No record
Riverside	1	89	76
San Bernardino	22	42	40
Inyo	88	45	See Dist. 7
Totals	340	801	393

District No. 7.

Mono	See Dist. 3	See Dist. 3	7 Est.
Alpine	No record	No record	14
Inyo	See Dist. 6	See Dist. 6	80
Total			101

Total for year 1911	6,489
Total for year 1912	7,535
Total for year 1913	8,269

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